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EDITORIAL NOTE

One of the largest Museums in Asia, the Indian Museum houses a rich collection of rare and priceless objects belonging to Archaeology, Art, Anthropology, Geology, Zoology & Botany. The Indian Museum Bulletin aims at highlighting any advancement, through research works and studies conducted from time to time, in these various fields. In the context of the present volume it may be mentioned that among its several varied resourceful activities, the Indian Museum has, since its very inception, played a significant role in highlighting the cause of anthropological studies in India.

The present issue, designed as a special number, incorporates anthropological studies based on the tribal life of eastern India, highlighting their economy, ecology and technology of production. The list of papers are based on the proceedings at a seminar organised by the Indian Museum in 1987. It is hoped that the present volume, while projecting the attempts made by the Indian Museum to spread the cause and effect of anthropological study in India, will enhance the readers' interest and satisfaction in the subject.

It is, however, very unfortunate that in spite of our best effort we could not procure relevant illustrations from the authors and, therefore, we are unable to incorporate any photograph in this volume. We sincerely regret for this omission.

PREFACE

The chapters within the purview of this bulletin are the outcome of a seminar on "Tribal Life in Eastern India", organised by the Indian Museum on 3rd and 4th December, 1987. The anthropological collection of the Indian Museum are mainly cultural artefacts which are the products of simple technology, having been influenced by economic reasons and local ecological conditions. Hence the topic of the seminar had been chosen from the museum point of view, highlighting the three factors—economy, ecology and technology of production, of the tribal material culture of Eastern India. Scholars attached to the different universities and research institutions, who were directly engaged in field research activities in the tribal belts, had been invited by the museum authorities for attending the seminar and contributing their rich and valuable experiences in the different spheres of the subject.

The papers read in the seminar are incorporated in this bulletin in order to circulate the discussions at the seminar, among a wider cross-section of people, both at home and abroad, as well as for highlighting the Museum's attempts to promote anthropological studies and activities.

I take the opportunity to thank all those contributors who participated in the Seminar and also to Dr. S. R. Sarkar, Ex-Director (Officiating) of the Indian Museum and Prof. P. K. Bhowmik who have taken pain to go through the Mss for providing their valuable opinions.

S. S. Biswas
Director

IDEOLOGICAL BASE OF TECHNOLOGY: THE INDIAN VISION

BAIDYANATH SARASWATI

Introduction

FEW living societies of comparable size pursue traditional technology over so large a geographical area and so broad a chronological spectrum as the people of India today. Yet there is no Indian anthropological theory of technology. The early works, initiated by the colonial administrator anthropologists, were rooted in the evolutionary and diffusion schools that developed in Europe and America. Indian scholars were chiefly interested to collect descriptive data and hence no endogenous insights could develop in the subject. The only exception to this was Nirmal Kumar Bose[1] who studied material culture from a truly independent position. His classical assumption on the pyramidal structure of Indian unity and diversity was based on landmark treatment of material culture traits. Bose also inspired a number of young scholars[2] to further the study of material culture and related aspects. But the trend of research set by him in the 50s was soon abandoned in the 70s. This is evident from the fact that the Indian Council of Social Science Research has, after the first survey[3] in the 60s, found it necessary to drop out the theme of material culture from its periodic survey of research in Social Anthropology.

With the decline of the diffusion school, the study of material culture lost its ground almost everywhere. But happily, a new concern in technology has of late emerged in Europe, especially in France where Marcel Mauss[4] has been the most venerable inspirer. An illuminating level of empirical analysis has already been reached by a team of French Scholars[5] at the CNRS and EHESS in Paris. The momentum of their research has given birth to a new Journal, *Techniques et Culture*. Since these scholars write their works religiously in French most of us in India are unaware of how material culture study is taking shape in that part of the world.

Why has not this new light of research come to India? Despite having such a rich field, why are Indian scholars disinterested in the study of material culture? Surely, these questions cannot be properly answered without serious historical and epistemological investigation. But, what seems to me the most apparent and simple cause is India's preoccupation with and commitment to development studies—changing traditional technology. The justification of this state of urgency is that while the developed nations can afford to pursue academic interest in the exotic objects of traditional societies, the developing nations, facing survival crisis, cannot remain content with their primitive technology. It is frightful to be a nation of 800—million people and to have inefficient technology of food and war. But, there is another dimension of the problem to which I wish to draw attention.

Contemporary anthropologists of technology—as reflected in their reappraisal and reformulation of the theory of material culture[6] —are still concerned with the evolutionary process 'from the simple to the complex', from 'homogeneity to heterogeneity'. The forms of the artefacts and the facets of technical activity are still examined in terms of the hierarchy of stages, and the human groups are differentiated by the structural differentiation in technology. Implicit in this treatment is that technology is a determining factor in man's innate ability and progress, and thus man is placed at the periphery of his own creation. Needless to say, and to put it mildly, that all traditional societies, with which anthropologists deal and on which their theory is based, would oppose this view vehemently. Even the "modern" societies are not prepared to accept their cultural differences in terms of technology. Differences and similarities in human groups are conditioned largely by the ideology and not by the form of technology. It is this neglected aspect of technology that I would explore in the following presentation.

Creative life in traditional societies, as we know, is governed by the religious practices and religious ideology is presented in the form of myth. Hence I take myth as the entry point in the present analysis of the traditional technology. For illustration, I turn to potter's craft which is man's one of the earliest creative ventures and which, even today, is deeply anchored in traditional societies. The major source of illustration is Haku Shah's *Votive Terracottas of Gujarat*[7], which in my opinion is the most excellent work on Indian traditional craft, with many methodological illuminations.

The Potters' Vision of Technology

The potters of Gujarat have developed a vision of technology which they share in common with their brethren in other parts of India. From their sacred myths and traditions[8] I have identified, at least, seven elements that build up the ideological base of pottery technology.

These are as follows:

(1) Divinely ordered

Pottery has divine origin[9]. Shankar killed a demon, from whose breast-bone he prepared the central part of the potter's wheel. The ribs became the spokes of this wheel. The demon's eye formed the base on which the wheel rotates. Shankar gave the potters his own staff to turn the wheel. And he gave the thread with which he tied his own hair to be used for cutting and removing the moulded clay vessel from the wheel[10].

Pottery has to be necessarily conventional[11]. The significance of even a single stroke on a pot is illustrated by the potters. Rama, during his exile, was passing by a well. He asked the *ged* (small clay pot for drawing water) if it had seen Sita. The *ged* replied that it had seen Sita and had wanted to rescue her from Ravana but could not do so. When Rama asked 'why not', the *ged* replied, 'How can I when I have neither hands nor feet?' Rama realised the truth and blessed the *ged* that thenceforth everyone would come to it for water. Saying this he made a single lengthwise stroke, *khahar,* on the pot from top to bottom. Potters still make this mark till today and call it *Ramni khahar* (Rama's stroke).

Even the price of the pottery goods has to be fixed in divine consultation. A potter from north Gujarat once invoked his deity Tubraj (the mountain god), 'I am now in trance, so fix the amount that I should charge for my goods from today.' Tubraj instructed him to accept some quantity of clarified butter for terracotta horse and elephant. The tribals believe that such horses carry the blessings of the deity. Even today the descendants of this potter seek divine guidance in making important decisions.

(2) Life-affirming

Technology must have reverence for life. Before igniting the kiln the potter prays:

Beware, O insects, the fire is coming,
The kiln is set afire.
Beware insects, ants and all living beings,
May the evil caused by killing these insects
Fall upon him who has returned evil for good
And takes away things without appreciation.
May the Lord strike such a one with leprosy.

Once upon a time, the newly married wife of a potter was working at the kiln-site and she noticed that some kittens had strayed into it. Her husband did not know this. She wanted to visit her parents' home which was close by so, not thinking that the kiln would be fired in her absence, she went out without a word to her husband. After a while, from her parents' house she saw that the smoke was issuing from the kiln. She rushed back, told her husband about the kittens and asked him to take the name of the Lord to protect them. Just then Hiranyakashipu, the denzien of the nether world, came along and told them that he should be invoked instead of Rama. This they refused to do. Hiranyakashipu threatened to crush the potter and his wife at the oilpress if the kittens died and said that there god could be considered real only if the kitten survived. The kiln gradually cooled and the pots were ready. And there at the bottom were four unbaked pots with fresh green sprouts growing in them and a kitten safe in each pot! Seeing this, Hiranyakashipu was abashed, and slipped away.

(3) Aesthetic value

Technology must attach utmost importance to aesthetic value. In western India, even the bottom of a pot is painted.[12] As the potters say, 'design embellishes a pot just as a woman's looks are improved by the ornament she wears in her hair'. In south Gujarat the women embellish the horse with the desire to create figures worthy of the gods. Using thumb and fingers they have evolved an enormous wealth of styles.

(4) *Simple, less than human*

Technology must be simple and necessarily within human control. At one time, the wheel used to rotate on its own. A potter once went away on a pilgrimage, leaving his wheel spinning. When he returned he saw that it was still spinning and that irritated him. So he kicked it in anger and it stopped.

(5) *Minimal needs*

To maintain the natural order of life and harmony in the society, technology must minimise human needs and bring contentment to fill mankind with heavenly happiness and the joy of creativity but no greed and indulgence. Bhagwan was going to be married and he asked the potter to prepare pots for his wedding. The potter than set about fashioning the vessels. When they were complete the potter discovered that they had turned to pure gold after being fired. He simply could not bear to part with these gold pots, so he started to get a second set ready. These in turn changed into shinning silver, and he put them aside as well. The next lot turned into gleaming copper, which he did not feel like giving either. Finally the pots remained clay and the potter offered them to Bhagwan for use at his wedding. Bhagwan was surprised and asked the potter how many times he had fired the pots. He told the potter that if he had brought either the gold or silver vessels, he would always have had gold and silver in his house. However, as he had been greedy and brought only the clay pots, clay would be his destiny.

(6) *Non-competitive*

To minimise economic disparity in the society and to allow people to develop their genius uninterrupted, technology must be non-competitive at the level of production as also at the level of knowledge. Pottery is the hereditary monopolistic occupation of the potter-caste. Even among them much of ones knowledge in pottery-making is gained by experience.

Bhagwan told Shankar that he had not yet created the people of the world, and he asked Shankar to do so. Thereupon Shankar created two figures. From the dirt rubbed off the left side of his body he created a woman, and from the dirt off his right side he created a man. This couple gave birth to children, and 18 castes came into existence. 'What knowledge can I give them so that they may earn their livelihood?' Wondered Shankar. To decide this, he made all 18 castes sit in a row. To one caste he gave a plough, to another he gave business acumen, to yet another he gave land, and so on. To the potter he gave the knowledge of how to work with clay.

The image-makers of Mulela in Rajasthan received a boon from Dharmaraj, the god of death, that so long as they make his image they will never die of hunger, but others trying to emulate them in this art shall turn blind and perish[13].

(7) *Towards divinity*

Technology must ultimately lead man to his divine destiny. It must enable him to pursue *purusartha,* the four aims of life, and to attain godhood. The potter performs the act of God in his archetypal role of Prajapati. He is aware of his role as he makes a terracotta horse. He says, 'from eight parts we create one soul', or 'inanimate parts are put together to form one animate whole—the horse'. There are ways of infusing life into the terracotta horse. It is marked with blood or a dot of vermilion powder—symbolic of life. This horse is then considered to be the God on the earth. The potter acts as a priest in many folk Hindu rituals[14].

"Modern" Man's Ideology of Technology

To grasp truly the "modern" man's ideology of technology one will have to refer to the views of such great luminaries as Ananda K. Coomaraswamy and Simone Weils. And to reflect the essence of their views I cannot possibly do better than quote some cardinal statements by A. K. Saran[15], one of India's greatest contemporary thinkers.

> 'Science and technology form part of systems of knowledge that man, at different times in history, has inherited (originally received as a gift from above) and with the aid of which he tries to grasp the universe in which he finds himself: "modern" science and technology are part of the "modern" *system of knowledge*. This system of knowledge (together with the science and technology that goes with it) has certain fundamental features that separate it from most other systems of knowledge (and science and technology) to an extent that makes its continuity with traditional systems of knowledge (and the science and technology which form part of them) highly problematical.
>
> Modern technology has achieved a number of new and startling material transformations. And yet any number of transformations remain irreversible (ashes into coal, rust into iron, etc.). This impotence plus the irreversibility of the human life-process set an unsurpassable limit to science and technology.
>
> Modern science has gradually come to be controlled by technology and this is why modern technology is not just a manifestation of "materialism" or anti-spiritualism. It is a new spirituality albeit a perverse or false one Dostoevsky's Kirillov saw this very clearly when he said:
>
> "If there is no God, I am God." It is the inner urge for a just and ever "progressive" society that sustains modern man's worship of technique, for he believes that only in an affluent society can the "higher" possibilities of man be fully realized, and affluence is largely and necessarily a function of an advancing technology. Accordingly, autotelic or "pure" science increasingly degenerates into technology-controlled and affluence-servicing science, and there thus develops a tension between science and society in which neither has a coherent case.
>
> Modern science and other systems of knowledge tend to be autotelic and autonomous; in consequence, technology (changing and "producing" reality) rules over science (understanding reality). From here the road almost invariably leads to the demiurgic ambitions of modern man, the catastrophic senselessness of which is now too manifest to be ignored.'

With this penetrating analysis of the "modern" ideology of technology if we turn to the traditional ideology, illustrated in the preceding section, we shall find that they are not only different but wholly opposed to one another. The main opposition between them may briefly be indicated as follows:

Traditional Technology	*Modern Technology*
1. Divinely ordered.	1. Humanly ordered: knowledge autotelic, autonomus.
2. Life-affirming.	2. Life-negating.
3. Aesthetic value oriented.	3. Materialistic value oriented.
4. Simple, less than human: higher values controlling technology.	4. Complex, more than human: technology controlling higher values.
5. Minimising human needs: bringing contentment.	5. Maximising human needs: creating discontentment.
6. Non-competitive.	6. Highly competitive.
7. Leading towards divine existence.	7. Leading towards the animal world of survival: deep entrenchment in temporal existence.

Conclusions

1. Anthropologists of technology are still preoccupied with their old evolutionary concern: determining the hierarchy of stages in the forms and the facets of technical activity, differentiating human groups by structural differentiation in technology. All traditional societies with which anthropologists deal would oppose the evolutionary theory of technology, as it does not tally with their vision.

2. Human groups are divided more radically on ideological rather than structural differences in the technology.

3. The potters of India have a primal vision of technology. They are called Prajapati, the Primeval Creator. Pottery tools and techniques of production are simple. More complex is the potter's vision. A potter identifies himself completely with the object he creates. His act of creation is ideally determined. Though he has no absolute freedom, his genius finds the fullest expression in representing the ideal type. He believes firmly that his creative faculty is God-given. His hands move spontaneously. He enjoys every moment of his activity. His work is not without life; he gives life to inanimate objects. His epithet of Prajapati is amply justified. He derives utmost satisfaction from his work. That subserves the Four Purposes of life. His perfection is judged aesthetically, not merely functionally.

4. Modern technological society presents an entirely different view-point. Man in his singular glory claims limitless liberty. In reality, he is merely a tool-making animal. Technology acquires efficient power, develops its own laws. Since "modern" man is enslaved by technology, his creative genius remains unsatisfied. He turns out to be a consumer. And ultimately, a self-destroyer, as the *bhasmasur* syndrome[16] of "modern" technology become operative.

5. Traditional technology in India continues, because it serves both the sacred and the secular needs of common man. Its ideological base is strong. It gives joy and pride of creativity which the "modern" technology takes away.

NOTES

[1] In 1956, Bose had written an article on culture zones of India, based on his personal observations as an incessant traveller. Later, when he became the Director of the Anthropological Survey of India, he initiated a project for making a much more detailed study of the distribution of the material traits. Out of this exercise he presented his germane ideas.

> From the information which has already been gathered in regard to these (material) items, it appears that relationships can be established on their basis with South-East Asia as with countries lying to the west and north-west of India. . . . "If regionalization is in evidence to a certain extent in relation to the material arts of life . . . the degree of differentiation is less in respect of the country's social organization . . . if one rises to higher reaches of life confined to ideas, or faiths, or art, the difference which one has noticed at the material level gets feebler and feebler. They are eventually replaced by a unity of beliefs and aspirations which gives to Indian civilization a character of its own."
>
> ". . . as we have said already, even the distinctions at the level of material culture override our language boundaries again and again. There is more unity in India's variety than one is likely to admit in moments of forgetfulness". (Bose 1961).

[2] For instance, Saraswati and Behura studied extensively the pottery techniques of peasant India (1966); Saraswati (1979) continued his search further on the relation between potter-craft and caste, and tried to correlate the contemporary pottery-making cultures with the ancient Indian civilization; Behura also studied the social aspects of the Orissan potters; Misra (1977) approached the nomadic blacksmiths of Rajasthan and collected treasures of data on their techniques and social life; and Mukherjee (1978) worked in the technical process in metal-craft.

[3] *See* Saraswati (1972).

[4] Mauss' *techniques du corps* (1936) contains the spiritual seed of any ethnology of techniques.—Lemonnier (1986).

[5] For instance, Lemonnier (1986) has contributed significantly towards building a theory of material culture; Sigaut (1984), who is interested in comparative history of techniques, has done insightful interpretation of agricultural implements and related aspects; and Mahias (1988) has attempted ingenious empirical test on the Indian foodways. See the review of *French anthropology* by Jamard (1985).

[6] New approaches of the anthropologists of technology, or ethnotechnologists are taking shape under the rubrics ethnoarchaeology, semiotechnology, anthropology of technical systems, etc. But they all invoked evolutionism in such ways as linking the technical levels with the hierarchy of stages (pre-artisanal, artisanal, etc.) in social and economic organization. Ethnic or group differences are sought in terms of the differences in technical systems or technical choices. My knowledge of French anthropology is poor, based on a limited readings of the above scholars. But it appears to me that this concern in the dynamics of heterogeneity—which may be called a movement toward microcultural evolution theory—suffers from a certain limitations. First of all, the new approach is tested invariably on the pre-industrial societies, and hence its universe is limited. Secondly, the correlation between social identification and technological differentiation is essentially structural rather than ideological. Implication is that social or cultural groups are formed on the primacy of material objects. This is ideologically unthinkable for any traditional societies about whom such a theory has been propounded. This does not seem to be true even in the case of the "modern" societies which cannot be differentiated meaningfully on the basis of material culture, for they all have reached to, more or less, the same level of technological marvels. If that makes them socially and culturally homogeneous, then we must say the evolutionary process 'from homogeneity to heterogeneity' has reversed. I think, comparative anthropology should now pay greater attention to the dynamics of homogeneity, which alone can liberate it from the bondage of evolution.

[7] Shah (1985).

[8] Ideology is a system of given ideas (*logos*). The ideology of a traditional society cannot be properly understood outside its ideals (myths). Panikkar (1979) makes a very important reflection on the relation between myth and ideology: "Human reality is complex because it is one: You cannot completely cut the *logos* from myth. You can distinguish but not separate them, since the one nourshies the other, and all human culture is a texture of myth and *logos*. They are like two aspects of the same Reality, or rather, they are like two constitutive threads that interwine to fabricate Reality."

[9] Also from the classical Indian view-point, all arts have divine origin, and Visvakarma, the Supreme artificer, is the patron of human craftsmen, *see* Coomaraswamy (1956).

[10] On similar origin myths in different parts of India, *see* Saraswati (1979).

[11] This is in complete agreement with the Indian theory of art, *see* Coomaraswamy (1956).

[12] *Cf.* Saraswati (1979).

[13] *Ibid.*

[14] *Ibid.*

[15] At the Hyderabad UNESCO conference, Saran (1978) presented a sustainable critique of "modern" science and technology.

[16] In the Pauranic tradition, there is a myth about Bhasmasur which runs as follows: Once a demon went on performing penance for thousand years to get a boon from Shiva. Pleased by his performance Shiva, finally, appeared before him and said, 'Ask a boon'. The demon prayed, 'If you are so pleased my Lord, grant that I may be endowed with power to reduce anyone to ashes simply by putting my hand on his head'. Shiva spoke, 'May it be so'. Now the demon wanted to test the boon forthwith on Shiva himself. And as he was about to swoop down on his benefactor, the god took to his heels in utter desperation. The demon Bhasmasur started chasing him. Eventually, filled with fright, Shiva approached Visnu for protection. Thereupon, Visnu in the form of Mohini (the charming woman) sat under a tree where Bhasmasur came up in search of his prey. Infatuated by Mohini's beauty he stopped there and asked her to make love with him. Mohini replied, 'I am a dancer, you can get me only if you could match in dance'. Bhasmasur agreed, and he began dancing in great excitement. Following her in the dancing gestures he uplifted his hand higher and higher until it touched his head and reduced him to ashes instantly.

This theme of the myth of Bhasmasur is a pointer to the human condition of our time when Man has granted the boon to demoniac technology.

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IDEOLOGY, TECHNOLOGY AND AGRICULTURAL PRODUCTION : SOME OBSERVATIONS

S. B. CHAKRABARTI

THE practice of tilling the land seems to have developed in India from the pre-vedic times. It is therefore natural that a system of production which has been built over such a length of time must have accumulated a systematic set of technological devices which have been used to ensure optimal exploitation of land. In organising this intimate social production, cultivators of soil also have developed some kind of ideological basis on which they have formulated and reformulated their strategy for interaction with the nature around them.

The connotation of "ideology" has been specifically restricted to "a systematic body of concepts especially about human life or culture." Similarly the connotation of "technology" has been restricted to "a technical method of achieving a practical purpose" (Webster's Seventh New Collegiate Dictionary, Indian Edition, 1970). Starting from these basic premises it is presumed that agricultural production is closely connected with a set of traditionally inherited ideas on the one hand and techno-operational devices on the other. Kusum Nair, a noted analyst of rural tradition and transformation of the third world in general and India in particular, observes, "The factors that determine the output and productivity of land and labour are the same everywhere—sun, soil, seed, water, intensity of cropping, and husbandry. Differences in natural endowments, accidents of history and random or deliberate acts of human judgement, however, have produced a vast array of different techniques, traditions and institutional arrangements—farming systems—for using land and labour in different parts of the Globe." In other words, what this quotation tries to underline is a kind of summation of peasants' perception at every stage of management of land, labour, crop, water, livestock, agricultural implements and so on and so forth. In a sense it includes both techno-ecological input on the one hand and socio-cultural input on the other. There is a complex network of optimal interaction between the two so far the agricultural operation is concerned. Mckim Marriott, while working in a North Indian village in the fifties, observed, "Rarely does technological change merely add new things; more often, it alters the pattern and the structure of people's lives. It does not just add, but creates a new structure or pattern, and often destroys an old structure or pattern." He develops a concept of 'over-development' which emphasises on "the pressing of techniques up to and beyond the point of an optimum relation between man and environment". According to him, "technology in an old over-developed area is likely to have become interconnected with many patterns of personal and social behaviour—groupings, ideas, beliefs".

When I was working in a Burdwan village in West Bengal I used to receive two kinds of messages through my discussions with two sets of people. The cultivator, by and large, used to express, "We do not consider agriculture as a business". When a major livelihood activity is looked upon by people as having a different set of values than what is apparently imminent, one is immediately struck by its extremely important ideological import. This can be considered in juxtaposition with another set of statement by the so called agents of innovation. They used to tell me that cultivators did not easily accept their (innovator's) prescriptions for a change over in the technology of production. One feels inclined at this stage to look back on the reality that exists on the surface. Perhaps the innovative measures as prescribed by the innovators are not very easily getting through on account of two factors—(i) the new ideas are not being naturalised in the cognitive system of the cultivators, and (ii) the new technology is not being felt as compatible with the age-old practices of the cultivators. A sharp contradiction emerges at this juncture—that is the innovators basic ideology to increase production does not find acceptance with the cultivators' ideology to maintain a moral order between ecology and technology.

This will be evident from a field work of Sinha about two decades back. He observes, "Being so wholesomely surcharged with supernatural connotation which binds men, tools, draught, animals and the land in a common moral order, cultivation of paddy becomes more than a mere technological operation". Here one can also bring in the idea of Julian Steward. For him "technology always operates in conjunction with other cultural factors that are causally inter-related with each other". ...."Taken together with technology as a system, these factors make up the controlling centre of a culture, the 'culture core'. The core itself is determined by the techniques of production it contains."

Now in the backdrop of what has been said so far I will come back to a particular field situation. This is a multi-ethnic village in the district of Burdwan, West Bengal. The area was exposed to a massive agricultural development programme in the mid-sixties. The village is inhabited by a large number of Hindu caste groups, the Muslim and the Santal. Though the cultivators share a more or less common ecological base with a commonness in their sharing of general beliefs and technological practices, yet at individual group level they occupy different position so far the attitude to agricultural production is concerned. One or two examples will illustrate the point in question. Though, by and large, the Hindu upper caste groups own a major part of the agricultural land, yet the Muslim cultivators are generally known as the good cultivators. Though the Hindu lower caste groups like Bagdi and Bauri supply a large part of the agricultural labour forces along with the Santal, yet the latter group is known as comparatively better workers in the land. This leads one to look at the situation little more closely.

Since the present seminar has specifically addressed itself to the question of tribes in Eastern India, let me, for clarity, take up the case of the Santal in a broad sweep.

The Santal, according to 1971 census, form about 9.55% of the total tribal population in India. Their largest concentration is in Bihar (49.58%), followed by West Bengal (37.90%) and Orissa (12.46%). Beginning from the observations of Baden Powell through Roy Burman to the recent researchers on Santal life and culture there appears to be a striking similarities in some aspects of their life. These are, a strong feeling of village community, little initiative for individual enterprise to become individual owner of the land, a strong sense of reciprocity of labour in agricultural production, general thrift for agricultural work and so on. These in sum speak for their attitude to economic life. One has to analyse historically whether this lack of individual enterprise along with particular pleasure orientation have led them to live an easy life even at the cost of rapid migration from their original homeland. So far the technology of production is concerned, whether it is agriculture or industry, they have proved their adaptive nature with tremendous skill. But at any rate they have not been able to establish their superiority in terms of ownership of the resources. So a kind of ideology has been definitely whipping them up to a great extent. If these indigenous factors hold good, then there is simultaneously an exogenous dimension to this reality with a different ideology and technology over which they have definitely no control. That is why there is a decline from 68.83% of cultivators in 1961 to 50.80% in 1971 and a sharp increase of agricultural labourers from 20.21% in 1961 to 40.89% in 1971. And that is the point which is perhaps beyond the scope of the present discussion.

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APPROPRIATE TECHNOLOGY FOR THE TRIBES IN INDIA

AJIT K. DANDA

I

IN a recent seminar on the "Application of Science and Technology in India", I heard one of the top experts in the field to lament: "when we pay our attention to the area of transfer of technology, the picture is rather frustrating. In spite of the availability of sophisticated knowledge at our command, very little could be successfully transferred to our villagers. The picture is even more dismal when we examine the situation among the tribes of India. They are not just capable of absorbing benefits out of such programmes".

The present author by and large endorses the factual validity of the information supplied through the given description of transfer of technology. He also shares the concern expressed by the experts to a major extent. What, nevertheless, he fails to appreciate is the tendency to somehow pass on the responsibility for any non-achievement to others.

In the process, people divide themselves into two cognitive categories and apparently derive satisfaction by being able to pin-point the reasons for non-achievement. Besides dividing the people, such an approach remains basically segmentary and thus stands in the way of inculcating the spirit of collective consciousness.

In the observation cited here, scarce regard has been shown to the fact that since the people have non-identical occupational, academic, and other backgrounds, it is only natural that their instant reactions to any innovation may be varied. Further, the priorities of specific individuals or selected groups may not be exactly one and the same as envisaged for the nation as a whole. Without paying close attention to such discrete facts, it becomes rather early or a statement of limited relevance when assumed uniformity is over-emphasized in this regard. When there cannot be any denial of the fact that the rural and tribal areas of India are technologically very much backward, it is perhaps unfair to think that the onus of adoption rests alone with the people themselves no matter whether the concern innovation is compatible with their techno-cultural backgroud and has any immediate applicability for them at the given point of time. In fact, two very important factors, as implied, are involved in the issue. One

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relates to the appropriateness of technology in the given context. The other deals with matters related to the process of transference and adoption of the same.

We often fail to appreciate that adoption as such is a fairly complex process depending on a number of factors simultaneously, each demanding special consideration. Under the circumstance can a sophisticated new technology be absorbed as it is, without consideration of the concomitant infrastructural developments? Requirement of improved technology notwithstanding, can very sophisticated technology or knowledge be spread out *en masse*? Even if it is possible, is it desirable? Further, what is the technology that we are so eager to transfer to the tribes and with what end in view? Have they been at all chosen taking the felt-needs of the concern people? Could the technological priorities of individuals or specific tribes on the one hand and the society at large on the other be exactly alike?

Several of the questions put here are apparently rather beyond the scope of main theme of discussion of this paper. They are, nevertheless, very relevant since they help in putting the issues in relatively better perspectives and hence we propose to take them up all over again in course of discussion of this paper. What, nevertheless, is considered very important in this context is to make a reference to the choice of definitions of the key concepts, since if not specifically pointed out, the reader is likely to assign normative meanings to the concepts. As we propose to emphasize nomothetic meanings to them, specific mention of the same is considered rather important.

Elsewhere I have discussed at length the problems associated with the definition of tribe in the Indian context (Danda, 1988). As the scholars are more in disagreements with one another on this issue than arriving at a consensus, it is all the more important that we specifically state what is meant by the major concepts used in the title of this paper like 'appropriate', 'technology', and 'tribe'. For the exclusive purpose of this essay, appropriate stands to mean "to make peculiarly the possession of some one or some group/groups". A reference to technology would convey "the totality of the means employed by a people to provide itself with the objects of material culture". By tribe here we refer to "a group of people who have been ever defined as the Scheduled Tribe by any competent authority"

From a close scrutiny of the definitions attempted here it would appear that when in the first two cases we have tried to attribute precise meanings to the concepts, the third one seems to appear rather purposefully vague. This is no doubt deliberate since it is considered more important to get reflections of the entire range than a sharp but somewhat static definition of the same. In the Indian context as detailed elsewhere (Danda, 1988), a tribe as such has been variously perceived. As a result, defining tribes in terms of a single set of attributes is immensely difficult. It becomes a problem of unfathomable magnitude, since in view of their respective socio-cultural experiences the Western societies had decided to look at tribes as something very queer or exotic. In contemporary India, the Scheduled Tribe as an administrative category is much more important than any population indentified as tribes in terms of any academic definition. Although the list of Scheduled Tribes in India varied with time and social contexts thus resulting in certain inherent possibilities for disagreements, this still remains the only exclusive document that for obvious operational advantage has been adopted here.

There is a general notion that technology as such is ordinarily culture-neutral. This notion is without doubt highly superficial since a closer scrutiny of the facts demonstrates that the value of technology or for that matter any innovation does not as such remain confined within its own ambit. In reality, the value of the same rests with the degree of compatibility between the attributes of the innovation and the capacity of the culture for their smooth accommodation. In other words, it is the nature of integration of the same that determines the real value of the technology or innovation in a given socio-cultural context at a specific point of time. Therefore, for any discussion on appropriate technology the contextual meaning thereof seems extremely important.

For determination of appropriate technology for the tribes in India, one of the first tasks, therefore, is to arrange a representative documentation of the livelihood practices actually in existence among the concern people. This, however, does not imply that all that are there need be upheld. The exercise is suggested in order to provide a scientific basis for determination of appropriate technology in a given context, with particular emphasis on appreciation of the dynamics of underlying forces and factors lending to their nature of validity and the rationable that are provided for continuance of the existing technological support. Such an exercise will throw light on their linkages with the productive activites as well as other spheres of life. Since the problem of technological augmentation among tribes has implicit in it the notion of harmonising endogenous processes with exogeneous productive potentials, for the limited objective of the present paper, we will make an endeavour for assessing their current livelihood practices alone.

II

If we add up the number of Scheduled Tribes as enlisted by the Census authorities against various States and Union Territories of India, they altogether make 671. Since several among them are distributed over larger territories transcending the boundary of State or Union Territory of their major concentration, multiplicity of entry in the State or Union Territory schedules has become inevitable. If instead, we shift our emphasis on the boundary of the tribe as a community or cultural group ignoring for the time being the political delineations, then the number of Scheduled Tribes in India, as per Census of India 1971, gets reduced to 464. The list could have further been reduced with rationalization of such phonetic variations like Bhotia and Bhutia, Mahali and Mahli or suffixes and composite categories.

In terms of physiographic distinctions, India can be divided into several identifiable regions each having its characteristic attributes to the demand of which the human groups living therein had to adapt. Obviously, the feed back of the forces of culture and ecology under the given circumstances had to be varied resulting in the manifestation of non-identical livelihood pattern. Since the Scheduled Tribes still to a large extent participate in undifferentiated economy, the picture projected appears more as a spectrum than any distribution of sharply defined professions. Still, in view of their major trends, a classification of the Scheduled Tribes on the basis of their livelihood pattern seems possible. Table I provides such frequency distribution of economic pursuits of Scheduled Tribes by levels of involvement.

TABLE I

Economic Pursuits of Scheduled Tribes

Economic Pursuits	Food Gathering			Animal Husbandry	Food Production			Institutional Economy		
	Collection of food	Hunting	Fishing	Cattle rearing	Shifting cultivation	Terrace cultivation	Settled agriculture	Crafts & profession	Trade & commerce	Wage labour
Levels of economic involvement	0	1	2	3	4	5	6	7	8	9
I	29	21	2	13	159	15	150	35	7	47
II	65	34	19	20	21	12	34	58	18	119
III	39	47	28	19	4	1	17	62	18	32
IV	12	17	6	11	4	1	9	17	10	17
V	Nil	6	12	8	Nil	1	1	7	1	1
VI	Nil	Nil	2	Nil	Nil	Nil	Nil	Nil	1	Nil
Total	145	125	69	71	188	30	211	179	55	216

From the distribution of Table I it becomes evident that the Scheduled Tribes of India have as many as ten basic means of livelihood beyond which there is hardly any other ever practised by anybody else. This suggests that inspite of their positive response towards new occupations, old ways of life have a lingering effect on them resulting in their non-differentiated economic pursuits. Among various means of livelihood, however, wage labour turns out to be the most popular. As many as 216 Scheduled Tribes do participate as wage labourers although only 47 Scheduled Tribes do the same as their primary means of livelihood. A fairly high proportion of the Scheduled Tribes of India, 25.65 per cent, practise wage labour as the secondary means of earning.

Settled agriculture as the means of existence closely follows wage labour, altogether 211 of the Scheduled Tribes having practising the same. There is nevertheless a difference since 32.32 per cent of the total Scheduled Tribes do settled agriculture as the primary means of livelihood. Shifting cultivation is also practised by a large number (188) of Scheduled Tribes mostly belonging to North East India. Over 34 per cent of the Scheduled Tribes do shifting cultivation as the primary means of livelihood.

The next occupation to follow this order is the composite category of craft and profession in which 179 Scheduled Tribes are involved. The bulk, however, practise it as the secondary or tertiary means of subsistence. Only about eight per cent participate in it as their primary means of livelihood. Then come gathering (145) and hunting (125) both as primary means of livelihood being followed by only a few Scheduled Tribes. Animal husbandry (71), fishing (68) and trade and commerce (55) as means of livelihood are practised by few Scheduled Tribes. Relatively fewer are those who do the same as the primary means of subsistence. In fact only two Scheduled Tribes have been reported to practise fishing as the primary means of livelihood.

Terrace cultivation is the least practised (30) profession as found among the Scheduled Tribes of India. Since terracing as such signifies a transition from shifting cultivation to settled agriculture, it is only natural that few Scheduled Tribes would follow the same.

It may be noted in this connection that if we add up the cell value of distribution even at the primary level, that would not agree with the total number of Scheduled Tribes in India. Since we could not procure any definite information about the economy of the Ghara of Orissa, Khan of Bihar, Pomia of Maharashtra and Savai of West Bengal, there remains an information gap. Further, there are a few instances where the concern Scheduled Tribes practise more than one primary means of livelihood. Nevertheless, the distribution manifests the basic trends of economy as followed by the Scheduled Tribes of India.

From a close examination of the distributions in Table I, a number of other observations can also be made.

1. The ten basic means of livelihood can be broadly clustered around four principal bases of economy.
2. Both the basic means of livelihood as well as principal basic of economy imply smooth transition through continuity inspite of the presence of major break-through points.
3. Despite the apparent notion of primitivity in the livelihood pattern of the Scheduled Tribes, there is hardly any area or profession that is out of bounds for the Scheduled Tribes.
4. If non-differentiated character of economy reflects any measure of primitivity, the economic pursuits of the Scheduled Tribes of India being over-whelmingly non-differentiated in nature, belong to this category. This is true even when they participate in modern institutionalised professions.
5. Since the scheme provided by the table represents the total range, distribution of secondary, tertiary or economy of any other order broadly fit into the same scheme.
6. Livelihood pattern of the Scheduled Tribes, despite their cultural moorings on the pre-agricultural means of subsistence, projects a fairly complex and intricate picture that justifies a detailed close scrutiny.

III

Providing new technology for economic regeneration has to depend not only on the priority fixed keeping the interest of the nation in view but equally on the local technical competence including (a) techno-cultural background of individuals/groups, (b) constraints posed by the supply of raw materials, (c) meaning of the concern technology to the area, people and culture, (d) local availability of know-how for maintenance of the technology, (e) skill in the introduction of innovations and assessment of felt needs, (f) peoples' capability to derive optimum benefits out of the implementation of the programmes etc. Inspite of the Scheduled Tribes having a high level of traditional skill, their extant of literacy being by and large limited, while programming promotion of technological skill, their traditional competence is usually ignored, so is their socio-economic mooring. Introduction of sophisticated new technology, under the circumstance, is considered as the only way out to usher a breakthrough. Invariably, this leads to a sort of economic dualism among the Scheduled Tribes. A new technology should be considered harmful if it leads to the development of an apparently antragonistic dualistic system of economy. It is welcome as long as it helps in diversification that ultimately results in the differentiation of economy.

Even the need for technology can variously be evaluated depending on where exactly the emphasis is put. Tradition oriented evaluation of technological requirement ordinarily lays emphasis on the characteristic local needs. National technological requirements usually get reflected through various modernization programmes which may or may not agree with the felt needs of the people of immediate concern area. Obviously, under such circumstances the local technological competence is not likely to be in a position to provide adequate support for the development and maintenance of the programmed technology. One of the foremost consideration should be that the prospective technology should match the preparedness of the Scheduled Tribes to derive maximum benefits out of them. Since the Scheduled Tribes, as already demonstrated, are at different levels of their technological competence, the minimum time required for adoption may also vary. Under the circumstances it would appear unjudicious if any programme is thrusted upon from above in a haste.

Since induction of experts and technical hands from elsewhere is a must in such a situation a careful prior assessment seems essential in order to evaluate the possible impact such induction of technical hands may have on the local people. Special attention is also necessary to work out what benefits the local people would derive out of such programme. As such an establishments based on borrowed know-how is bound to create pressure on the local resources. Therefore, mere compensation of loss in monitory terms cannot be adequate. It is required to be ensured that induction of such technology does not eradicate the local crafts adversely affecting their economy and pattern of livelihood to the people to any major extent. As long as the need of the local people is in mutual agreement with the priorties of the nation, induction of such programmes does not pose any serious threat. If they reflect opposed tendencies, do difficulties arise that demand special attention. Since under such circumstances the local communities possess very little strength to make any further sacrifice for the society at large, it is the responsibility of the larger society to ensure that such national programme do not disintegrate the local communities. It is likely to be rewarding if instead of having an uniform pattern the Scheduled Tribes with comparatively diversified skills are picked up as early adopters. Those who have been exposed to varieties of situation are likely to be relatively more prone toward adoption.

Technological programmes can be decided upon taking the universal needs and global competences in view. Under such circumstances, the national as well as the local priorities and competence are to be carefully examined and it is to be ensured that such programme of induction of technology does not adversely affect the national and local skill whatsoever available at the local level.

Attention is also required to be paid to the question of goal for such technology induction programme. It is well known that the technology of a people have important upon the culture of them. The question that one must address oneself at this stage is whether it has been really decided upon that the concern society should reshape itself as per norms set by the technologically developed societies or otherwise. By way of homogenization, technology too, has the power to disintegrate local cultures. Naturally it is required to be closely looked into whether a people should altogether sacrifice its own culture or has the freedom of option for such technology alone that ushers growth without any jeopardy to the concern culture.

Since along with other factors choice of technology depends on the thrust as well as orientation of the concern society, the basic question one is confronted with is not whether technology or culture. The obvious choice as it appears, has to be technology with culture. What is important, therefore, is to pay attention to the degree of compatibility between culture and technology in order to determine appropriateness of the same in the given socio-cultural context.

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TECHNIQUES OF AGRICULTURAL PRODUCTION IN RESPECT OF ORISSAN TRIBES

N.K. BEHURA
B.K. BEHURA

THE State of Orissa is situated on the Eastern coast of India and extends from 17°49′ N to 23°34′ N latitude and from 81°27′ E to 87°29′ E longitude. It comprises an area of 1,55,842 square kms and is bounded by the States of West Bengal in the north-east, Bihar on the north, Madhya Pradesh on the West, Andhra Pradesh on the South and the Bay of Bengal on the East.

Geographycally, Orissa can be divided into five parts, such as, (a) coastal plains (b) the middle mountainous country (c) the rolling uplands (d) the river valley and (e) the subdued plateaus.

The coastal plains

The coastal plains of Orissa extends from the Subarnarekha river in the north to the Rushikulya river in the south. This region is narrowest in Chilka coast, narrow in the north, broad in the south and widest in the middle. Six important rivers, such as, the Subarnarekha, the Budhabalanga, the Baitarani, the Brahmani, the Mahanadi and the Rushikulya flow in this region. This region of Orissa is most populated with fertile land.

The middle mountainous country

Almost three-fourth of the area of Orissa lies in the mountainous region and is a part of Indian Peninsula. This region can be divided into four units, such as, the Simulia and Meghasani mountains, the Baitarani and the Brahmani interfluent, the watershed between Brahmani and Mahanadi and the watershed between the Rushikulya and the Vamsadhara.

The rolling uplands

The rolling uplands are lower in elevation than the plateaus. They are situated in the Koel-Sankh basin of the Upper Brahmani, the Ib, the Suktel and the Tel of the middle Mahanadi and the Sabari basin. The rolling uplands may be grouped as follows: The Rajgangpur uplands, the Jharsuguda uplands, the Bargarh uplands, the Bolangir-Titlagarh-Patnagarh uplands, the Bhawanipatna uplands, the Malkangiri uplands and the Rairangpur uplands.

The river valleys

River valleys are the product of the action of rivers. The major river valleys of Orissa are associated with the rivers Brahmani, the Mahanadi and the Vamsadhara.

The subdued plateaus

The subdued plateau reveal all the peculiarities of peninsular tablelands. These plateaus can be divided into the Panpose-Keonjhar-Pal-Lahara Plateau and the Nowarangpur-Jeypore Plateau.

Climate

As Orissa lies in the sub-tropical belts, the chief characteristics of its climate are high temperature and medium rainfall. Four well defined seasons prevail in Orissa, they are:

(a) Cold dry winter (December, January, February)
(b) Hot dry summer (March, April, May)
(c) Monsoon season (June, July, August, September)
(d) Cool autumn (October, November)

The State of Orissa though was constituted in 1936, it assumed its present form in 1948 with the merger of several princely states with this province. The ex-state area comprises the western districts, namely, Mayurbhanj, Keonjhar, Dhenkanal, Sundargarh, Bolangir, Kalahandi and large parts of Sambalpur district. The southern districts of Ganjam and Koraput were under the Madras presidency prior to the formation of Orissa State in 1936. The coastal districts consist of Cuttack, Puri and Balasore. Taking into consideration historically, culturally and ecologically, the State of Orissa consists of three sub-regions.

The State of Orissa has a population of 2,62,72,054 according to 1981 census. The tribal population of Orissa comes to 59,15,067, who belong to 62 scheduled tribes, which is 22.43% of the total population. These tribes belongs to three major language families of India, namely, Indo-Aryan, Austric and Dravidian. Tribes belonging to the Dravidian language preponderate over others. The second position is occupied by the tribes of Austric language family. The co-existence of the tribes of different language families in Orissa is indicative of the fact that the State constitutes the confluence of the two broad cultural traditions of India, namely, the northern and the southern. Out of the 62 different tribes, 13 tribes have been chosen (Appendix-I), which are the important ones, and are at different techno-economic levels, for illustration of their agricultural techniques.

All the tribes of Orissa are not on the same plane in the techno-economic parameter. Some are primitive and some are advanced, and the tribes of the Indo-Aryan language family are Hinduised in varying proportions. Each tribe has its individual cultural identity, although there are broad structural and cultural similarities between all the Orissan tribes. The tribes of Orissa do not have the same type of subsistence economy. On the basis of subsistence economy Orissan tribes may be classified into three categories, such as, Food- gatherers and Hunters, Shifting Cultivators and Settled Agriculturists. The food-gatherers mainly live by hunting, fishing and gathering of different kinds of roots, tubers, flowers, fruits and leaves from the forest. The best example of such tribal communities in Orissa are the Birhors and the Hill Kharias. As it is beyond the scope of this paper, we will not deal here on the techniques of gathering and hunting of these groups. The shifting cultivator constitute an important section of the tribal population of Orissa. Many tribal communities like the Bonda, the Saora, the Kondha, the Juang, the Bhuiyan, the Didayee, the Koya and the Gadaba primarily depend on shifting cultivation. The settled agricultural tribes are the Santal, the Ho, the Munda, the Binjhal, the Oraon, the Mirdha, the Bhumij, the Gonds and the Bathudi who are mostly attached to the soil. Some tribes also practise shifting cutltivation alongside settled agriculture.

The total land area of Orissa is 37 million acres or 1409 million hectares. Approximately 35.50 per cent of the land is utilised for cultivation and 21.9 per cent is occupied by forest. Due to the sharp change in topography and soil, there is change in the types of crops grown in different parts of Orissa. So the structure and land influences the land utilisation method, type of farming and the culture of the people that inhabit it.

Technology is the combination of techniques common to a group devised by man for his existence on this earth. For his existence on this earth fundamental needs are to be fulfilled, those are: food, shelter and clothing. Out of this necessity man has devised technology and has been constantly improving it not only to maintain his status in the cosmic material system but also to ease the problems that constantly surround him. The means of adjustment and control over the natural environment, of food production, security, survival, offense and defense, are all technological in nature. Hence, technology constitutes the vital nerve of any culture, which is but a means of carrying on the life-process of man everywhere. It is not only important for survival but also for raising the standard of living. Therefore, it is the determinant of the parameter of socio-cultural progress. In any culture the techno-economic dimension constitutes its basic aspects, which in turn determines the nature of social structure.

Shifting cultivation in Orissa

Shifting cultivation is practised in most of the tropical countries of the world under various names. In India, it is known as *Jhum* in Assam, *Tekonglu* in Nagaland, *Adiabik* in Arunchal, *Hooknismong* in Tripura, *Pendar, Bewar, Dahia* in Madhya Pradesh, *Waler* in Gujarat, *Kurmi* in Tamil Nadu, *Kurao* and *Khallu* in Bihar and *Podu* in Andhra Pradesh. It is also popularly referred to as *Poduchas* in Orissa. It is known by different terms among different tribes of Orissa. Among the Orissan tribes it is known as *Biringa* or *Kaman* among the Pauri Bhuiyan, as *Dahi, Kaman* and *Taila* among the Juang, as *Bagada* or *Sarban* among the Saora, as *Haru* among Dongaria Kondha, as *Rama* among Desia Kondha, as *Kunda Chas* among the Bonda and as *Lankapadsenad* among the Koya.

The economy of the tribes of Orissa is a mixed one. No tribe solely depends on a particular economic activity. Most of the tribes of Orissa practise shifting cultivation or settled agriculture or both together. The Koya, Gadaba, Didayee, Bondo, Pengo, Kondha, Dongaria Kondha, Kutia Kondha, Saora, Jharia in South Orissa and the Pauri Bhuiyan and the Juangs in North Orissa are conspicuous shifting cultivators.

Shifting cultivation is the world's oldest and the simplest form of agriculture dating back to the lower Neolithic period. In a very broad sense, we may define shifting cultivation as a method of agricultural system by which the tribes cut bushes, shurbs, trees on the top and slopes of the hills and raise mixed crops for at least three years and then abandon the patch of land until trees grow sufficiently for further utilization of the same land. There are conflicting reports about the total area under shifting cultivation in Orissa, due to the very nature of the practice. M.F. Mooney has estimated that about 12,770 sq. meters was under shifting cultivation in Orissa from the table given at Appendix-II, it is evident that a sizeable tribal population is engaged in shifting cultivation.

Necessity of shifting cultivation

Shifting cultivation is practised by the tribes living in hilly areas. It is wrong to say that the tribals practise shifting cultivation out of their fancy and good-will, rather they are in a way forced to do it. It has been reported by many that the tribals were in possession of some low land, but in course of time, due to their simple nature these lands have been taken away by the non-tribals. So they have no alternative than to practise shifting cultivation on the hill slopes. Many of the tribals of Orissa have found the methods of shifting cultivation more to their liking as it does not involve complex methods of the wet-land cultivation. The tribals are simple and, by and large, are non-literate even now, so they lack the ability to change over to settled agriculture, whenever an opportunity is given to them by the Government. The shifting cultivators are not in a position to switch over to wet-land cultivation in the plains for various reasons; they are unable to articulate properly with the administrative machinery, Government officials and others. With the increase in the population, they require more cultivable land. As they can acquire large plots without much difficulty on hill slopes and in forest-clad areas, they prefer this type of cultivation. They undertake shifting cultivation entirely depending upon monsoon rains. They follow simple techniques and use crude tools. They are not competent to use complex tools and implements required in wet cultivation. Practically no manure is used in shifting cultivation operation. The ashes of the burnt trees and bushes serve as manure. The attachment of the tribals to shifting cultivation can be understood from the following example. A researcher had undertaken fieldwork among the Pauri Bhuiyan of Bonai sub-division of Sundargarh district, where colonisation scheme of the Government was in vogue. Under this scheme of the Government, the Pauri Bhuiyan of *Tal* and *Upar* Ginia villages were resettled in two colonies. Land, bullocks and agricultural implements were provided to the settlers in the colonies. Other facilities like drinking water, school, approach roads, fair-price shops etc. were also provided to them in these colonies. Although all these facilities were given the Pauri Bhuiyan settlers they were very reluctant to leave their original village. But after repeated persuasion by the Government officials and supported by two educated Bhuiyan youths of the area, they left their village for the colonies. But after living for two years in the colonies and taking all the advantages and facilities offered by the Government, they looked back to their original villages. One or two persons of each of the households again went to their original village during shifting cultivation time and started practicing it as before. So in a way they maintained two villages and derived benefit from two sources. So, the Government's colonisation scheme was a failure. In the past land in the tribal areas had not been surveyed and settled. Therefore, the tribals freely used land, forest and other resources in their habitats. The traditional system of land ownership and control among the tribes of North Orissa was different from the tribes of South Orissa. In North Orissa there was communal ownership of resources, whereas in South Orissa all the village resources were fully controlled by the village headman. In South Orissa the village headman allots a plot or patch of land to a villager for shifting cultivation on approach. But among North Orissan tribes all the villagers together select the patch of hill slope and distribute the land among themselves.

Selection of shifting cultivation plots

In all the tribal villages of Orissa the area of the village, with all its resources, is well marked. Each village includes hills, fallows, forests, streams, waste land, pasture, plain lands etc. So the selection of the patch of land for shifting cultivation is done within the recognised boundary of the village. It is a practice to convene a meeting of all the households heads for discussion about the patch of land in the hills to be selected for cultivation. All the household heads attend the meeting. After deliberations on the matter a plot is selected. There are certain methods which they follow in the selection of the patch of land, for instance, the Juangs in a chorus utter "*Haribol*" and carefully listen to the echo. They select the patch on the side from where the echo comes. The village headman and the village priest play an important role in selection of the plot. Among the Kondha the role of the village priest or *Tlamba* is of utmost importance. *Tlamba's* opinion on the selection of the land is given due importance by the Kondha *rayots*. The village headman *Pradhan* also accepts *Tlamba's* decision. At the time of selection of plots various factors are taken into consideration such as, distance of the plot from the village, duration of the recuperative period, suitability of the plot for good crop etc. It is a general practice to keep an used plot fallow for at least 7 to 8 years. In the past the recuperative cycle in Kondha area was 15 to 20 years, but now it has been reduced to 7 to 8 years. The recuperative cycle varies from one tribe to the other. Among the North Orissan tribes it is longer, but it is very short, even 4 to 5 years, among South Orissan tribes. This is due to shortage of land and over population.

Distribution of plots

Land meant for shifting cultivation is communally owned by the villagers among most of the tribes of Orissa, particularly those inhabit the northern part. Families have the right on such land only as long as they cultivate it, which normally extends to a period of three years. Among Northern Orissan tribes, such as, the Pauri Bhuiyan and the Juang, shifting cultivation land is the property of the village. But among some of the tribes of South and Central Orissa a marked difference is noticed. Among the Saora and the Kondha shifting cultivation land is regarded as the personal property of the cultivator. One can sell or mortgage the shifting cultivation plot. So far as the tribes of South Orissa are concerned there is no need for distribution of land, but one has to take the permission of the village headman for using a patch of hill slope or forest land.

A day is fixed for allotment of plots and on the appointed day all the household heads of the village among the Kondha, the Bhuiyan and the Juang, assemble at the Youth Dormitory with their axes. Then they all go to the selected patch of land in a procession being led by the village priest. The first plot is allotted to the village priest and then the next plot to the village headman. The distribution procedure varies from tribes to tribe. After the village priest and the village headman have been allotted plots, other villagers are given their respective plots one after another. The size of the plots allotted to the villagers depends on their capability and size of the family. In case of any dispute with regard to the size or location of the plot, the matter is settled by the village priest and headman at the spot. After allotment the allottees demarcate their respective plots. Widows and disabled persons are also provided with plots for shifting cultivation. They cultivate their land with the help of their relatives, and some of them also engage labourers for the purpose.

Felling

After the patches have been allotted to individual families, usually in the months of February and March, comes the heavy operation of clearing the patches from trees and shurbs. All male and female members of the family above 9 to 10 years of age help in the operation. Care is taken not to cut fruit-bearing and other useful plants in the plot. They do not cut the trees, such as, Mango (Mangifera indica), Mahua (Bassia Latifolia), Kendu (Dyospyros embryotoris), Jack Fruit (Artocarpus integrifolia), Tamarind (Tamarindus indica), Jaman (Hugenia Jambolana), Banyans (Ficus banghalensis), Salap (Caryota integrifolia) etc. The operation of cutting the trees takes place down-hill upwards. The male members cut the big trees with axes, whereas the young and female members help in clearing bushes, shrubs, tall grasses etc. with small axes or sickles. When the plot of land is too big for the family to cut the trees, kins in other villages are requested to help them, which is reciprocal.

Burning

The trees and bushes, which are cut down are left in the original places to be dried up by sun. But the Saoras cut the felled-trees into pieces and these are piled up in heaps at different spots of the plot. Usually during the months of March and April burning operation takes place. Among most of the tribes of Orissa burning operation is conducted by the male members and children are not allowed to visit burning sites as far as possible. Ashes are strewn all over the field before the onset of monsoon.

Hoeing and sowing

In the months of May and June, just after the first and second rain, they start digging their land with hoe. The auspicious day on which seeds are to be sown is decided by the village priest. The crops usually raised by the tribes of Orissa in the shifting cultivation field are hill rice, *Mandia* (Eleusine Coracany), *Kangu* (Pennisetum italicum), *Burburi* (Vigna Cutanga), Maize (Zey Mays), Pulses, such as *Biri* (Phaseolus Mungo), *Jatingi* (Guizotia abyssinica) *Kandul* (Cajanus indicus) etc. The method of sowing, types of seeds etc. differ from one tribe to the other. Marked difference is seen in the method employed in shifting cultivation operation by tribes of South and North Orissa. Therefore, examples from the Pauri Bhuinya and the Juang of Northern Orissa and the Saora and the Kondha of South Orissa will be enough to illustrate this point.

For the first year of shifting cultivation, during the months of May and June, the Pauri Bhuiyan women plant castor seeds in little holes on the feet of big trees or in the crevices on the rock. After this on another day they plant in holes seeds of cucumber, melon and gourds near the rocks. Some seeds of beans like *Jhutua, Suturi* and *Ruhuia* are planted on the feet of trees. After planting all these seeds they wait for rain for some days. And after the first rain they dig big holes and plant seeds of *Kanduani Saru*. All the planting of seeds are usually done by women, but men also help whenever necessary. The village deity is warshipped in the month of *Asarh* (June-July), which is called *Asardi Puja* by the Pauri Bhuiyan. After this Puja the main crop *Biri* (Puaseohes mungo) is sown by broadcast method. After sowing *Biri,* if possible on the same day or on the next day they sow *rasi* (Guizotia abyssinica) along the bounderies of the shifting cultivation field. Sweet Potatoes, Termeric seeds are sometimes sown in the field.

In the second year of cultivation in the field, they mix paddy with *Gangei, Tisria,* Melons and Cucumbers and sow the seeds in the field by broadcast method. After the seeds are spread on the field, the male members plough the field. If the soil is rocky and it is not possible to plough, they use a pick-like tool with a hook of iron called *Gardani*. Then the seeds of *Gangei* (a type of millet) mixed with *Tisria* or *Kathia* millets, are sown on the ridges of the plot. Some also plant seeds of chillies on the ridges.

In the third year of the cultivation in the same plot, they sow *Jali* (Echinochloa Crus-galli) in the months of May-June, after the rains, by broadcast method. Then the field is ploughed or seared with picks.

In the months of April Saora sow red gram (Kandula) by putting the seeds in small holes. After the red grams have sprouted they sow all other seeds together like *Kangu, Jana, Ganga, Ghantia, Kusula, Mandia, Balla* (bean), country peas like *Jhudanga, Barugudi* by broadcast method. Thereafter the soil is worked by their hoes. They also grow a kind of citrous plant called *Susunap,* which provides fibres. These fibres are used for making ropes. The Saora never use plough in their shifting cultivation field as is done by the Pauri Bhuiyan.

Weeding

Weeding is usually done in the months of June and July by women and girls, but men also help in the operation. The weeds are put together on one side of the plot and left like that to rot. New grown bushes are also pulled out. If necessary, second weeding, operation is undertaken in the month of October or November.

Watching

The standing crops need constant watching or else wild animals and birds destroy them. Watching is usually done by men and grown up boys. Watching the crops is purely a family affair. They build a small hut inside their shifting cultivation plot over a raised platform, called *Machan*. During the day-time women members of the family are also engaged in watching the crops. There is always the fear of damage to the crops from wild animals like Wild Boar, Porcupine, Bear, Monkeys and Birds like Peacock, Jungle fowl etc. During night time constantly wooden logs are burnt in order to scare the predators. They use bow and arrow, ordinary pebbles to drive the animals and birds away from their field. To spend their time, they beat drums, play flute and also sing. The wild animals and birds are driven away by the sound of the beat of drums also.

Fencing around the shifting cultivation plot is very rarely done by the tribes of Orissa. But among the Pauri Bhuinya, in some areas a barrier around the field is constructed by heavy wooden logs. This is primarily done to protect the field from elephants.

Harvesting

Different crops are harvested in different seasons even if the seeds are sown at one time. Among the Pauri bhuiyan the crops are harvested from the months of October to April. *Biri,* which is the main crop of the first year cultivation is pulled in the month of November. The *Biri* plants are spread in the shifting cultivation field to dry up. When the plants are completely dried, these are brought to the harvesting floor and beaten by wooden clubs. The Saora start harvesting from the month of August with the crops like *Kusala, Kangu,* small *Gangai* etc. In the month of November *Gangai, Ghantia, Burugudi* and *Jhudanga* are harvested. The method of collecting the plants removal of seeds, method of threshing etc. differ from one tribe to another.

Rituals connected with shifting cultivation

The whole life of the tribes of Orissa revolves round religion in their economic, social and political activities. They have great faith in super-natural beliefs. So far the auspicious beginning of all the agricultural operations like selection of hill patches, feeling of trees, burning, sowing, harvesting etc. are concerned, the rituals are performed for the smooth conduct of the work.

Pauri Bhuinya rituals

Asadhi Puja—This *Puja* is held in the Hindu month of *Asarh* (June-July), usually during the bright fortnight. After this ritual, *Biri,* the main crop of first year of shifting cultivation, is sown.

Sarani Puja—This *Puja* is held in the Hindu month of *Bhadrav* (August-September) before weeding is done in the field. This is performed with a view to ensuring smooth growth of plants.

Gundamanda or khala Puja—When the late paddy is reaped and threshed with the help of cattle, *Gundamanda* or threshing floor ritual is observed during the Hindu month of *Margasira* (November-December).

Tithia Puja—It is observed in connection with the ceremonial sowing of paddy.

Several rituals are observed among the Saora at different stages of shifting cultivation operation. *Buyya,* the village deity is worshipped before the seeds are mixed for sowing. By observing the rituals on time as per tradition tribals believe that health, safety and security for humans, crops and their livestock are ensured.

Division of labour

The responsibility for cultivating the plot lies entirely with a family. So work is distributed among the family members according to their ability. Among the tribes of Orissa work pertaining to shifting cultivation is distributed as follow:

Adult Male—The household head has the over all responsibility in all the operations of shifting cultivation. The household head and other adult male members (18 years to 50 years) of the family undertake the strenuous work of cutting trees, ploughing, sowing and watching the crops at night.

Adult female—They also help at all stages of shifting cultivation. But in some tribes they are forbidden to plough or sow seeds. The work of cutting bushes and uprooting grass, cleaning of seeds for sowing, weeding, and carrying of seeds to the field are all done by women.

Young boys—The young boys between 10 to 17 years of age are not given strenuous work at the field. They help in cutting bushes and help at the time of harvest.

Young girls—Young unmarried girls between 8 to 16 years of age are not encouraged to visit shifting cultivation field very often. They stay at home to look after the young ones and some of them cook food during the absence of their mothers.

Old Men—Old men who are not physically fit to go to the shifting cultivation field stay at home. They help in selecting good seeds and help in repairing the agricultural implements.

Old Women—Old women who are physically unfit are exempted from work in the field. if they are fit, they do all the work of an adult woman. They take care of the children, if they stay at home.

The tribals strictly adhere to certain customary rules regarding their agricultural activities. The women are prohibited for doing any agricultural or auspicious work during their menstruation and pregnancy.

Tools and Implements employed in shifting cultivation

The tools and implements used in shifting cultivation are very simple and crude. The tribals procure these implements locally or prepare themselves and they do not have to depend on outside supply. Most of the tribes of Orissa work the soil in the shifting cultivation field with a hoe. But the Pauri Bhuiyan plough their shifting cultivation field with a simple plough. Other tools and implements employed in shifting cultivation are described below. Most of the tribes of Orissa use these implements in their shifting cultivation operations with some variation in some of the implements.

Tools and Implements of the Pauri Bhuiyan (Appendix-III)

Digging stick or kodi—It is the most primitive form of implement used for digging up roots and tubors from the field. It is prepared from a more or less straight branch of a tree and its working end is sharp. Sometimes a pointed iron head is hafted into the working and in order to make the tool more effective.

Hoe or Gordan—It is a pick-like tool with a hook of iron. It is used for scratching up the soil after sowing. The handle is dragged by a person usually in sitting position and the blade goes deep into the soil.

Plough or Nangel—Plough is the most effective implement for tilling the soil. Most of the tribes of Orissa use plough for wet cultivation, but only few of them like the Pauri Bhuiyan, Juang, Gadaba and Koya use it for shifting cultivation also. A typical Pauri Bhuiyan plough consists of four parts such as the handle, the body, the shoe or lead and the beam. The free end of the beam is tied to a yoke which in turn is tied to the drawing animals. The driver presses the share slantingly by holding the handle to till the soil. They use usually single log plough. But some variation in the construction of plough is also noticed.

Yoke or juali—Yoke is a long, solid, and relatively rounded piece of wood of about 5 feet long and about 3.5 inches thick. This is kept on the shoulder of the animals who draw it. Two wooden pegs known as *Sala* are attached at the ends leaving one foot from both the extreme sides. By this the necks of the bullocks do not slip outside. There are two holes, where the rope passes through and the bullocks are harnessed.

Leveller or Mag—It is made out of a slightly curved rectangular piece of plank of wood, having weight. Usually it is made from *Sal* or *Kendu* wood. A handle is attached at the middle of the plank. There are two rectangular holes, little interior to the two ends, through which ropes are passed and tied to the yoke. The driver holds the handle with left hand and drives the animals with the right hand. The leveller presses on touching the ground due to weight of the plank. This implement is used for levelling the land at the time of transplantation in wet cultivation.

Sickle or Dā—It consists of two parts—the wooden handle and the iron blade. The iron blade is serrated. The cutting edge of the blade is concave in outline and the working end is pointed. The butt end is hafted into the handle. The handle has a depression in the middle and the cross section of the handle is circular. The implement is held by hand with its handle and then it is used for cutting crops. Many varieties of sickle are found among the tribes of Orissa for different uses. The sickle which has no serrated edge is used for cutting grass.

Lever or Ukhunibadi—A narrow bent piece of iron, looking like a sickel, is fixed to a barrow or wooden stick, the length of which is about 4 feet or longer or shorter according to the height of the user. It is used for separating the straw or stalks from the grains at the time of threshing.

Crowbar or Sabal—It consists of a solid piece of iron bar, whose working end is either pointed or sharp. It is used for digging the soil. Crowbar of different sizes are purchased from the weekly market or procured from the local blacksmith.

Spade or Kudali—It consists of two parts, the iron blade and the wooden handle. The flattened iron blade is fitted to a wooden handle through its socket. The working edge of the iron blade is sharpened for cutting the soil. The length of the handle varies from 1.5 feet to 2 feet. The handle makes an angle of 45° to 60° with the blade. This implement is used for digging the soil.

Axe or Budia—This implement consists of two parts the iron blade and the wooden handle. The length of the wooden handle various according to the choice and convenience of the person using it. The wooden handle is inserted into the socket of the blade. The blade is socketed to the handle tightly in order to ensure firmness. At times, small wooden pegs are inserted into the socket to keep the handle tight. The handle and the edge of the axe are roughly parallel to each other. The edge of the blade is very sharp. The blade is thicker at the socket and gradually tapers towards the working end. The operator holds the handle firmly with both hands and cuts wood in to and fro manner. Two types of axes are found among the Pauri Bhuiyan. The small axe is called *Budia,* which is used for cutting soft and small trees and the big axe, which is called *Tangia,* is used for cutting hard and big trees.

Scythe or Kati—This implement has a convex back blade and the cutting edge is sharp. The blade is firmly hafted into the handle. It is used for cutting grass, bushes etc.

Hooked axe or Katra—To a long wooden or bamboo stick a hook like iron is fitted. It is used for debushing the field.

Wooden stick or Thenga—A long wooden pole of about 4 feet long is used in threshing the grain by beating.

Pestle or Muda—The entire pestle is made out of a single piece of wood. The handle is cylindrical in shape. the handle is smaller in size. It is used for removing husk from cereals. The working end of the pestle is fitted with an iron ferrule.

Seeds for sowing and the harvested grains are carried in bamboo baskets or *Tupa.* While watching the crops at the shifting cultivation field, they use bow and arrow, battle axe as weapons of defence. Shifting cultivation is a way of life for all those who practise it. In other words, shifting cultivation constitutes the focal point of their culture.

Demerits of Shifting Cultivation

Some scientists have opined that shifting cultivation is not necessarily a harmful practice. If due regard is given to the nature of slope, soil, and sufficient time is given to regeneration, it will not lead to gradual degeneration of land. They have opined that slopes neither too steep nor too gentle one ideal plots for cultivation. A steep slope invites the agents of erosion for degradation. Soil which have no boulder and not very porous are also suitable for this cultivation because porosity controls the water retention capacity. But it is not always possible to adhere to these by the tribals, because they have to cultivate land within the boundaries of their respective villages.

The disadvantages of shifting cultivation may be as follows:

1. Shifting cultivation process causes streams down the hill to dry up.
2. It causes the soil of shifting cultivation land to be washed away, and the rocks get exposed.
3. Due to this practice, floods occur on the valleys endangering the lives and property of the people.
4. It brings down heavy silt into the ponds, lakes and ditches of the lower area and they are filled up by these silts. The silt also destroys the crops in the valleys and plains.
5. It destroys the vegetation in the hills by which the rock surface is exposed causing erosion of the soil. the fertility of the soil is also lost quickly due to the soil erosion.
6. It causes deforestation that affects the rainfall.
7. It affects animal life as the animals cannot live without vegetation.
8. By cutting trees and bushes at random, there is tremendous loss of forest products.
9. It also leads to nomadic habits of the people and for this reason difficulty arises in administration.

Due to the above reasons the Government have been making attempts to prevent the practice of shifting cultivation. But inspite of the intensive efforts by the Government it has not been possible to stop this pernicious practice. The causes for adherence to shifting cultivation by the tribals are numerous. These are due to the ignorance of and reluctance to learn better methods, scarcity or non-avaibility of suitable lands for settled agriculture, paucity of fund for cattle, implements, seeds, manures etc. and also they have a strong belief that stoppage of shifting cultivation will hurt their deities, and in turn, they apprehend great damage to their livelihood, health and property.

The Government has undertaken colonisation schemes to settle the tribals practising shifting cultivation in plains, as this practice is considered both uneconomic and harmful. So a number of colonies have been set up in different parts of Orissa and the tribals are settled to in these colonies. Results in many colonies are very encouraging. But in some colonies (example given earlier), it is not very successful. Some other developmental schemes have been implemented by the Government, which are not being discussed here.

Terrace cultivation

In hilly areas terraces are constructed along the slopes. It is the first step towards settled agriculture. Terrace cultivation is practised by some tribes of Orissa, such as, the Saora, the Kondha, the Gadaba etc. The terraces are built on the slopes through generations of hard labour and skill. In terrace cultivation the available hill slopes are fully used and also they enable the water of perennial hill streams to be tapped for cultivation throughout the year as the water flows from one terrace to another in downward motion. The terrace walls are rivetted and packed with stones and boulders, which cannot be washed out easily. In terraces, main crops grown are paddy, and some other selected crops are also grown as in shifting cultivation. The

Government has encouraged terrace cultivation on some parts of the tribal area, wherever it is possible. But this type of cultivation is not practised in many parts of the tribal area of Orissa. This is due to the reason that the nature of terrain in many parts is not suitable for the construction of terraces. It is also very difficult to construct irrigation channels there.

Settled agriculture

In Orissa several tribes are settled agriculturists, namely, the Santal, the Munda, the Ho, the Bathudi, the Bhumiji, the Mirdha, the Binjhal, the Savara, the Oraon, the Kisan, the Saunti, the Raj Gond, the Lodha and the accultured section of the Kondha. Apart from these tribes, others who mostly depend on shifting cultivation also practise plain land cultivation, i.e. those who posses land in the plains. The major crops grown by tribals in the low-land cultivation are different varieties of paddy, which depend on the quality of soil, seeds etc. the techniques applied in such cultivation are almost equal to that of the non-tribals residing in the area. Generally three types of low land cultivation are practiced by the tribes of Orissa such as, wet-land cultivation for paddy, kitchen garden for vegetables and horticulture for fruits.

Paddy cultivation

Immediately after the harvesting, the farmers are engaged in preparation of the land for next year cultivation. After the first rains in April-May, they plough the field with the help of a pair of bullocks. Some of tribes also use cows and buffaloes for this purpose. Usually women are prohibited from ploughing the field. Ploughing is always done anti-clockwise to 3 to 4 times.

If the first course of tilling has been done length-wise then the second is done breadth-wise, and the third again length-wise. This is done with a view to loosening the soil of the total field. In dry cultivation seeds are either broadcast or sown in a planned manner in the furrows. In wet-land cultivation seeds are broadcast after they are sprouted or transplantation of saplings is done in a planned manner. In dryland cultivation leveller is used after seeds are sown for breaking the clods as well as for covering the seeds with soil, but in wet-land cultivation levelling is done before the broadcasting of seeds or before transplantation.

There are three broad classes of paddy, which are used by the farmers of Orissa. They are *Biali* or *Autumn* paddy, which are sown in May-June and harvested in August-September, the *Sarad* or winter paddy sown in June-July and harvested in November-January and the other variety is *Dalua* or Summer Paddy, which is transplanted in November-December and harvested in March-April. Among the Orissan tribes all the three methods are applied for paddy cultivation viz (1) Dry cultivation (2) Semi-Dry Cultivation (3) Wet-Cultivation, depending on the type of land and availability of water.

Dry Cultivation—In the Northern Plateau, Central table land and in Eastern Ghats of Orissa dry cultivation is practised. Autumn paddy is generally mixed with *Rahar* (Cajanus indicus) and *Ragi* (Eleucine corcana). By the time *Rahar* sheds the area, paddy gets matured and is harvested.

Semi-Dry Cultivation—In the Delta tracts and in the *Borna* and *Bahal* lands of the hilly tracts, paddy is first sown after one or two showers of rain. When the monsoon breaks or as soon as irrigation water is available in July, the land is ploughed to loosen the soil.

Wet Cultivation—This is practised in case of transplantation of paddy saplings. Transplanted paddy gives higher out-turn than the broadcast paddy. In the canel-irrigated area and in the *Berna* and *Bahal* lands of hilly tracts paddy is transplanted in the month of July. Dalua paddy is generally transplanted, which is sown in November or December.

In the Northern plateau and Eastern Ghats region transplantation is customary, but in the Central table land and coastal tracts paddy is sown by broadcast method before the onset of the monsoon rain. Broadcast method is preferred in these areas in order to overcome the danger of excess of rain and flood water.

Kitchen Garden—Kitchen gardens are situated near the homestead land. Almost all the tribals who practise wet land cultivation and have their houses in the plains, posses kitchen gardens. They grow vegetables like brinja, gourd, snake-gourd, pumpkin, cucumber, tomato, greens, beans, chilly etc. in the kitchen garden. In many areas, the tribals also grow tobacco, ginger, canliflower etc. They use these vegetables for their own consumption. But now-a-days they have started selling part of these products for money.

Horticulture—In the hilly areas of Ganjam and Koraput Districts large streches of land on the hill slopes are devoted to pineapple, organge, and banana plantation. The Saora and Dongria Kondha have now become very proficient in this type of cultivation and are earning a lot from this. Turmeric is also exclusively cultivated, both on hill slopes and in the plains by the Kondha of Phulbani and Koraput. They earn a sizeable income from these crops. In addition to these the Kondha, the Saora and other tribes have started planting improved varieties of mango, jackfruit and tamarind, both for personal consumption as well as for commercial purposes.

Socio-economic Relations in Production

Socio-economic relations in production is discussed here on three bases, such as (1) Kin based relation (2) Inter-ethnic economic relation and (3) Inter-village economic relationship.

KIN BASED RELATIONS

Most of the tribal families of Orissa take assistance of other family members of the village in some productive activities. Four basic types of agricultural kin-based relations are evident among the tribes of Orissa. Due to techno-economic advancement kinship ties are becomming gradually weak, and their place is being taken up by individual-centric and interect-centric relationships. From this it is evident that tribal societies are steadly changing over from their segmentary nature to that of stratified ones.

(a) Labour Contracted on daily basis with remuneration;
(b) Reciprocity;
(c) Exchange of labour for the use of bullocks for ploughing, and
(d) Pooling of bullocks.

(a) *Labour contracted on daily basis*—Temporary workers contracted for one day or sometimes even for several days are engaged for any of the various productive activities. The contracted workers of the village are usually assigned work at the time of clearing the shifting cultivation field from trees and bushes. The workers receive paddy as their remuneration for their labour. In very rare cases cash payment is made. The amount of paddy varies from one tribe to the other. Usually the mid-day meal is provided to the worker.

(b) *Reciprocity*—Reciprocal assistance is most commonly taken during the time of tree felling operations. If two male members of a household help at the time of tree-felling, then the same number of male workers reciprocate. The same type of reciprocity also occurs in connection with other agricultural activities. Labour exchange on reciprocity basis is seen among almost all the tribes of Orissa.

(c) *Exchange of Labour for the use of Bullocks*—These are some tribal families, who do not posses bullocks. Such families borrow bullocks from their kins who possess bullocks for ploughing the land. It is customany to plough the land of the bullock-owner for a day, for lending a pair of bullocks for a day. This practice is found among the Pauri Bhuyans and the Juangs. The borrower rarely assists the owner of the bullocks in any other activity in exchange of the services of the animals.

(d) *Pooling of Bullocks*—If two households of the village own one bullock each, then by mutual agreement the two bullocks are pooled together and used in ploughing the lands of both the households alternately.

Apart from these relations between kin members of the village, many other socio-economic relations also take place between them, such as, exchange or loan of one type of seeds for another, exchange of agricultural implements etc.

INTER-ETHNIC ECONOMIC RELATIONS

Jajmani relations among the tribes of Orissa are not well developed as is practised among caste Hindus. Here by Jajmani relations, we mean inter-ethnic economic relations. In one locality several castes of specialised occupations live together. So the relationship is found to be intense. But tribal economy is characterised by similar type of economic activities for all the households of the village.

The tribes now depend on other ethnic groups/caste communities a lot for the day to day activities of agricultural operation, and for this purpose a type of rudimentary Jajmani relationship is established with different caste groups of the locality. They have to depend on the *Kamar* (Blacksmith) for repairing and sharpening their iron implements, for getting earthen pots on *Kumbhar* (Potters), for the manufacture or repairing of wooden implements on *Badhai (Carpenter)* and for, bamboo basket on *Ghasi* caste. For these services in many tribal areas like the Pauri Bhuiyan, the Juang, the Kondha, the Gadaba, the Saora, the Mirdha, the Binjhal etc. the tribal communities depend on artisan castes, and pay the latter in kind annually after the harvest. But in many cases, they make immediate payments for the service either in kind or cash. The *Gaudas* (Cow-herders) are engaged by the Juangs for grazing their cattle and pay the former annually. It is a practice with the tribes of Orissa to depend on Scheduled castes, such as, the *Ganda,* the *Ghasi,* the *Pana*, the *Dom* etc. of the locality in defferent spheres of activities. They are an integral part of tribal economy, as they are the middlemen or brokers in buying and selling the agricultural products of the tribals. And therefore, inter personal and inter-communal relations among the Orissan tribes are recast in a new way so that they are forming a new dimension of the local social order.

INTER-VILLAGE ECONOMIC RELATIONSHIP

On few occasions inter village economic relationship takes place. One village may temporarily utilize a section of land (hill slopes) belonging to the neighbouring village. Usually an oral agreement is made between elders of both the villages in this regard. Of course, economic relationship is very common between individuals of two villages, but on rare occasions inter-village economic relationship takes place. This type of inter-village economic relationships have been noticed by some researchers among the Pauri Bhuiya, the Juang and the Kondha.

Role of Government in Agricultural Development of the Tribals

After independence Government of Orissa has implemented various developmental schemes for the agricultural development of the tribals. Some of the Developmental schemes are:

1. Land reforms,
2. Reclamation of waste land,
3. Soil conservation,
4. Provision of irrigation facilities,
5. Use of Improved seeds,
6. Use of better mannure and fertilisers,
7. Use of better tools and implements,
8. Improved practices of cultivation,
9. Provision of cheap agricultural credit,
10. Control of insects, pests and diseases,
11. Setting the shifting cultivators in colonies, and
12. Better marketing facilities for agricultural production.

As it will be very lengthy, it is not possible to discuss here the impact of these development schemes of the Government on the tribals.

APPENDIX-I

Major Tribes of Orissa

Major Tribes		Total Population in Orissa (1971 Census)			Distribution in District
		Male	Female	Total	
1.	Khond	431,716	438,24	869,96	Phulbani, Koraput, Kalahandi, Ganjam, Bolangir.
2.	Gond	247,231	252,03	499,26	Sambalpur, Koraput, Kalahandi, Bolangir.
3.	Santal	225,741	227,212	452,953	Mayurbhanj, Balasore, Keonjhar.
4.	Saora	168,364	174,393	342,757	Ganjam, Koraput.
5.	Paraja	102,652	104,047	206,699	Koraput
6.	Kolha	156,810	152,778	309,588	Sundergarh, Keonjhar, Mayurbhanj.
7.	Oraon	81,399	83,220	164,619	Sundergarh
8.	Kisan	90,769	89,256	180,025	Sundergarh, Sambalpur.
9.	Munda	112,107	110,010	222,117	Sundergarh, Sambalpur.
10.	Gadaba	23,600	22,994	46,594	Koraput
11.	Koya	30,137	29,031	59,168	Koraput
12.	Bhuiyan	92,761	95,451	188,212	Sundergarh, Keonjhar, Dhenkanal.
13.	Juang	11,888	12,496	24,384	Keonjhar, Dhenkanal.

APPENDIX-II

Area affected by Shifting Cultivation and tribes practising it in Orissa

District		Total area in sq. k.m.	Tribe practising	Approximate size of the population
1.	Koraput	11,528.07	Bonda, Didayee, Koya, Kondh, Gadaba, Saora.	340,000
2.	Ganjam	2,980.11	Lanjia Saora	79,000
3.	Sundergarh	2,270.06	Pauri Bhuiyan	15,000
4.	Keonjhar	2,527.73	Pauri Bhuiyan Juang	28,000
5.	Phulbani	8,435.20	Kondh	195,000
6.	Kalahandi	1,323.50	Kondh	33,000
7.	Sambalpur	1,913.24	Kondh	2,000
		30,977.91		6,92,000

APPENDIX-III

Implements used in Shifting Cultivation by Pauri Bhuiyan

No.	Item	English Equivalent	How Procured	Uses
1.	Kodi	Digging Stick	Fashioned by them	For digging purpose.
2.	Gordom	Hoe	Iron portion purchased wooden portion made by them	For scratching up the soil after sowing.
3.	Langal	Plough	Wooden portion fashioned by them or by local carpenter and ploughshare purchased	Tilling the soil.
4.	Juali	Yoke	Fashioned by them	Harnessing.
5.	Mae	Leveller	Made by them or by local carpenter	For levelling the soil.
6.	Da	Sickel	Purchased	Weeding, cutting, crops.
7.	Ukhunibadi	A long stick with hoocked iron rod	Iron part purchased and men prepared by them	For seperating the straw from the grains at the time of necessary.
8.	Sabal	Crowbar	purchased	Digging.
9.	Kudali	Spade	Iron blade purchased and the handle is fitted by them	Digging, Levelling the soil.
10.	Budia	Small axe	Iron blade purchased and the wooden handle prepared by them	Cutting soft trees and bushes.
11.	Tangia	Big axe	-do-	Cutting hard trees.
12.	Katra	Scythe	Iron blade purchased and the wooden handles fashioned by them	Cutting grass, bushes.
13.	Thenga	Wooden Stick	Fashioned by them	Used in threshing the grain by beating.
14.	Muda	Pestle	Fashioned by them	For removing husk from cereals.

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TECHNOLOGY OF PRODUCTION IN SIMILAR ECOLOGICAL SETTING: EXAMPLES FROM FRINGE-BENGAL

P. K. BHOWMICK

I

THE 'natural history' of man comprises continuous interaction of various groups of people, eco-system—organic as well as inorganic. The human part of the environment has a distinctive culture. That is reflected in various activities, centering round its production systems for the perpetuation and survival of its kind. Man adapts himself to a particular eco-system and this produces a distinctive behaviouristic traits. Technology of production is related undoubtedly to an ecological setting which also determines population structure, normative behaviour and, ultimately, all these are woven into the thick fabric of social institutions and cultural matrix. Thus, it is accepted that in any natural situation, ecology and the environment, the culture of a given people are interlaced distinctively. Steward defines cultural ecology—'as the interaction between technology and culturally defined manner of exploiting the environment.' Therefore, technology is the outcome of interaction of man with his environment for existence and the perpetuation of his kind.

It is also an accepted fact that ecology connotes active mutual relationship between living organisms and their environmental situations and this concept is associated with Darwinian and post-Darwinian thinking. It is true that ecology fills a natural gap in biological science, and a close examination of the situation of man and environment interpretes the entire gamut of culture of a group in a natural setting. Forde (1963) has clearly interpreted the relationship of physical environment and human activities—as cultural pattern embodied in the mass of knowledge and belief and all aspects of culture are functionally interdependent upon one another.

We have to accept that similar ecology generally has a type of prolonged impact over the group of people when science, technological discoveries and inventions are not treated separately. Interactions with the similar situations resulted a series of traits which are pigmented in the socio-cultural life of the people. It is to be accepted that culture as a system is a mutually reinforcing practice backed by a set of activities associated with beliefs and values, needed for the perpetuation and the survival of the group.

II

An attempt has been made in this paper to examine the technology of production of some groups of people in a micro-region of similar ecological setting in fringe-Bengal. Here fringe-Bengal has been considered a political fringe, *i.e.,* the area of West Bengal bordering Bihar and Orissa. But, geographically, it is more or less a continuous whole or an extension of Chotonagpur plateau where a series of rolling ridges gradually lowering down towards east with sporadic lateritic sheets and occasional granite outcrops are seen. Criss-crossing these are found almost dried rivulets during the summer months which are unflordable but gargling during the rainy season and ultimately clothed with a green of vegetation comprising dwarf *Sal* (Shorea robusta) trees, Mahua, Asan, jack-fruits and their ilk. This area originates from the Archean times and also bears the evidence of the Archaic type of civilisation—reflecting Paleolithic or Old Stone Age civilisational tools like hand-axes or coupe-de-poings, choppers etc. it also leads to a continuity having New Stone Age cultures evidenced by the find of plenty of chipped, polished celts or axes, even limited with a number of rare shouldered celts and profuse microliths, indicating the use of composite tools for mixed agriculture and allied type of economic activities. The autochthonese are mainly represented by the Mundari-speaking Kolians, Santals, Mundas, Mahalis, Koras and Lodhas. If we restructure these so-called early settlers, we will be in a position to distinguish them on the basis of their present economy pivoting the technologies of production with identifiable cultural disparities. They are as follows:

1. Lodha—a gathering-hunting group of people;
2. Mahali—Basket-making community;
3. Santal and the Mundas indulging solely in plough cultivation and other occasional subsidiary practice of hunting.

All these groups of people are considered as 'Scheduled Tribe' for the purpose of administration and to grant them constitutional benefits from our Republican Welfare State, as all of them genuinely belong to the weaker section of Indian population. Of course, we cannot ignore the existence of other castes and communities who are numerically dominant. Historical process of interaction—its continuous impact and the reaction of the people since hoary past moulded their life-style though traditionalism or primitivism to some extent can be overlooked. That is why we emphasise that culture/tradition has been buttressed and cushioned from time to time by the groups with their beliefs, values and manifestational patterns. Yet in the same geo-political situation, when impact of welfare activities through Government machinery or otherwise they are more or less the same and it is only the culture which can be very positively attributed to such variations. There might be some converging forces to compel these diverse groups to accommodate with better ideas and habits for better living and assured prosperity. Naturally, the aspect of technology of production with little historicity has been examined in this common ecological setting of fringe-Bengal in relation to these four communities only as mentioned previously.

III

The Lodhas are gathering-hunting people. For administrative purposes they have been designated as 'Primitive Tribal Group' (PTG) having a poor economy and pristine culture. They speak distorted Bengali and in Midnapore district they have a concentration of around 26,000. As stated above, they as a gathering-hunting group, can be distinguished into two sections, mainly on the basis of their habitations. Those who live in greater jungle-covered areas of Nayagram in the Jhargram Subdivision, including Gopiballavpur are termed as the 'jungly' by the same group of the deforested areas of the Sadar Subdivision of the same district. Some of them are gradually associating themselves with the activities of settled agricultural life under compelling circumstances and, as such have to work as agricultural labourers in the houses of others, being landless. But the extent of their earnestness in such activities is doubted by their employers. Still they prefer to persue the following activities and take the risk of getting these all the time. They have some inclination in such work.

1. Collection of honey, fruits, edible roots and tubers (*Tita-alu,* a type of Yam, *Chirka* etc.) from the nearby areas and also water-lily from tanks and ditches;
2. hunting games—of different types of birds, *godhi* (Bengal monitor or lizards), hares, field-rats etc.;
3. all types of fishes, molusca, tortoise, snails and their variants;
4. for collecting wild variety of paddy which grow at marshy areas, but ripen only one after another, unlike the paddy which ripens in bunch.

They have requisite appliances or implements for such purposes. Most of these appliances are home-made and are prepared by themselves only in recent times. They take the advantage of purchasing arrow heads made of iron from the local smithy. This very clearly indicates that their technology of production related to the environment and can sustain small groups or families. Practically it augmented atomised or small families where many of their obligations or family ties are feeble in nature. Besides, there is also the division of labour depending on the age groups and consumption of food on the basis of the seasonal availability with formal taboos and prohibitions as set down by the traditions.

Mahalis are basket-making community. Possibly in olden times they belonged to the Santal (hor) stock, as their clan organisation system or clan-names are like the Santals. May be, in some historical period a section of the Santal gradually specialised themselves in bamboo work like the caste-guild occupation, *i.e.,* on *Mah* or bamboo, as per Santali, and thus they are called as Mahali. Specialisation in bamboo work minimised many of their other agrarian prusuits and this endeavour encouraged the group gradually to be accommodated in the same space with less competition. Though growth of population encroached, to some extent, upon the avaliable land and different occupations relieved the pressure to some extent. The Mahalis (47,247 : 1971) at present engage themselves in basket-making which is considered to be their main occupation. But a good number of them having a little land take to agricultural activities and gardening using a portion of their homestead land. Hunting is almost absent among them, but it is present in the case of the Santals. For basket-making, or preparing screen-like wicker work, they are the only experts. The male folks go about collecting bamboos from the locality, whereas the females engage themselves in spliting them and weaving these carefully. Their children are also experts in spliting bamboos which are used for all types of basket-making. They require for their work scythe, bill-hook etc. prepared from iron, and these are all available in the local market. It is to be noted here that these groups of people always get cash in exchange of their wares, except on rare occasions when paddy is given in lieu thereof. Here, physical environment supply them with raw materials which are processed as finished articles. These are purchased by the local inhabitants. As they get cash by selling their goods, they are to depend on market for food and, like other groups, they have taboos and prohibitions.

The Santals are the largest tribe (13,76,980 : 1971) in West Bengal and they are distributed in many States. Their main occupation is cultivation with ploughs, but they sometimes follow subsidiary activities by hunting and fishing. As they are settled agriculturists, rice is their staple food. Besides, in marriage ceremonies, paddy and bullocks are given as bride-price before solemnisation of the marriage. For agricultural purposes, they have different types of implements and some of these are prepared by themselves and some are purchased from the markets, especially from the blacksmiths. For this purpose, they can pay in cash or kind. Division of labour is in vogue among them, specially during the hunting. Ploughing is done by the male members only. Females are engaged in light types of job—transplanting paddy plants, reaping and threshing. The types of paddy or other minor vegetables they grow are all of native variety, except in a few cases where modernisation offered alternatives to them.

Their food habits are largely related to the environment and ecology as well as their traditions with usual taboos and prohibitions. Though there is an impact of Christianity on the Santals of the locality, still there is very little trace of it on their life-style, except on the poorer class of them.

The Mundas (1,98,701 : 1971) are practically a migrant group of tribal community who, due to certain pressure of circumstances during the historical period, penetrated into this tract of land in search of food and shelter. Practically, as a peace-loving docile people, having the memory of their forest living, they settled in this region of Bengal and slowly accustomed themselves with the agrarian life. They are plough cultivators and also practice occasionally ceremonial huntings which are in vogue in the Santal life. This thing is almost fading out from their memory. They are good cultivators and, like the Santals, are fond of growing a little vegetables which they can and, as such, there is the division of labour among the members of the group. Generally, ploughing or strenuous activities are allotted to the male folks, the females strictly adhere to light jobs, including transplantation, harvesting and so on.

Their food habit has more taboos and restrictions than others. They do not eat beef or pork like the Santals.

They have all types of agricultural appliances available to them. Some of these are prepared by themselves and some are purchased from the local markets, especially the iron-made implements.

IV

Four tribal communities of Austro-Asiatic linguistic groups referred to here have been considered about their technology of production in a similar ecology. It is very clear that common ecology, administrative setting and politico-social environments offered them to react for various purposes in respect of their adjustment, perpetuation and survival. Besides, after Independence, many changes have taken place, in the country, *viz.,* communication facilities etc. which minimised their chances of isolation; various welfare programmes initiated by the Government also changed their life-style. This, again, has facilitated to get education and employment at various places and these have brought them out from their narrow environment causing accelerated interactions with the people in and around. With all these, we still find differences and disparities. Even now, these groups can be kept in isolation and can be easily identifiable through many traits and manifestations. Should all these be attributed to their culture that once developed out of interaction with ecology and environment? It is true that the world of the so-called tribal communities in India has taken a sea-change and this has extended their world view and reoriented their activities, bringing overall changes to the life-style.

Steward (1955) writes:

> "Constellations of core features which arise out of environmental adaptations and which represent similar levels of integration."

But there we find differences specially among these groups of people. Firstly, the Lodhas are still in the habit of using crude technology—their devices for catching games and fishes are very crude. Even they are better in catching fishes with bare hands, whereas others differ in this respect. Thus, we find that the Lodhas are in a more backward position with unstable and cripple economy which directly interrelated them with their social institution and other organisations. All these taken together have fostered a spirit of isolation, and these people can be identified easily from the rest.

The case of the Mahalis is of different nature. The survival strategy in common limited areas encouraged a section of the bigger *Hor* race to be segmented and they are specialised in a particular profession of bamboo work, like that of the caste-guild occupation. Here, possibly due to the influence of the local caste group and their non-competetive profession encouraged the segmentation of the bigger group into two. This practically facilitated their mutual interdependence and maintained the solidarity.

The case of the Santals and the emigrant Mundas is quite striking. The Santal in the regional setting are considered to be more active-ethnocentric, but eager to change their social and economic life through education and participation in varied activities. This is due to the largeness of the group and their being in touch with the greater society in this way or that. That interactional processes helped them to be involved with many more alluring situations.

The Mundas are basically more Hinduised, docile and imitative in nature and they practically are in a position to adjust themselves with the changing situation under compelling conditions. Naturally, their adaptation with the affairs concerning them are more discernible.

The technology of production of these groups, though varied in nature in many cases, can still be identifed with their survival strategies.

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MODERNIZING TECHNOLOGY AND ITS SOCIO-ECONOMIC IMPLICATIONS IN PRIMITIVE SOCIETIES OF ORISSA

UMA CHARAN MOHANTY

MODERNIZING technology is not only a characteristic feature of Western world, but it has also become the global goal in the present context. With the emancipation of colonial territories, the new states have kept the modernization of technology as a means for their economic growth and development. But due to various factors the success achieved by Western world in economic development is not possible in many of the traditional societies of the third world. Therefore the economists and other social scientists are now busy analysing the socio-cultural factors that inhibit the process of economic growth. In this context anthropologists also try to analyse the factors that inhibit the adoption of modern technology. The present paper does not aspire to make such detailed studies either at macro or micro-level. Here an attempt is made to briefly present the techno-economic situation of tribal societies of Orissa and the present process of development. Finally, the argument is advanced that for the development of tribal societies, modernizing of technology is most essential and action-oriented research plans can be experimented in tribal areas before these are introduced in wider areas.

Tribal situation in Orissa—its techno-economic features

Orissa contains the highest number of tribal communities and they constitute 25% of the state population. These large number of tribal communities in no way represent a homogeneous culture nor do they have uniformity in their economic life. Some are food gathering nomadic tribes such as Mankidia, Malhars, Koruwa and Kolhas and a few artisan communities. But by and large majority of tribal communities are agriculturists and depend heavily on agrarian economy. These tribal communities can be broadly categorised into two groups, the first group depending on hoe cultivation and the second group depending on plough cultivation. The latter group adopts dry farming in uplands and rice cultivation in rain-fed narrow valleys. But the former group is more interesting and it adopts slash and burn cultivation in hill slopes; some of them also combine rice cultivation along with their podu cultivation. The Santal, Munda, Kol, Oraon, Sa-a-ra or Sabara, Kisan Khadia, Binjhia, Binjhal, Gadaba, Paraja, plain Juangs etc. belong to the latter category, while Hill Saoras, Dangaria Kandhas, Kutia Kandhas, Juangs, Hill Bhuyans belong to the former category. Each group has its special wide varieties of tools and tool techniques. The plough cultivators have various types of ploughs which are locally fabricated by the tillers, keeping in view the nature of the field whether these are narrow paddy lands, fountain beds or high uplands. Usually such ploughs do not make deep furrows yet these are suitable for the local necessities and capacity of draught animals. Primitive shifting cultivators of Orissa have special features of their economic organization. Hard work is carried out along with dance, music and feasting during reciprocal labour organization. Through shifting cultivation they provide a green canopy to these sparsely covered hills or hill slopes. Of these, the Dangaria Kandhas are most interesting horticulturists. The Saoras make marvellous terraced fields along with hill slope cultivation. The Juangs have perhaps crudest form of tools and techniques. Usually these communities adopt mixed farming in extensive fields and raise a variety of crops containing pulses, oil seeds and many varieties of cereals. All these they raise with very simple tools, such as tiny axes or narrow hoes which fulfill the requirements of major workloads of their agricultural operations. Though these tools are simple, by virtue of sheer physical efforts, the tribals achieve wonderful results. With generations of experiments in adapting to the environmental conditions, and management of water, these primitive food producers create wonder in the minds of advanced cultivators. The Saoras of Ganjam and Koraput can carve out terraced rice fields out of hill slopes with such dexterity that they receive universal appreciation.

The subsistence economy of the primitive peasants is no way less productive, and most often leads to surplus of production. Therefore, barring a few years of drought conditions, the primitive people produce bumper crops in extensive hill slopes. Such successful agriculture brings surplus production in certain cases or in certain years and such products are used in feasts, festivals and ritual practices. Thus success in agriculture leads to efflorescence of tribal culture.

The self-sufficient tribal economy was somewhat disturbed during colonial period. The market economy entered into tribal pockets and locally organized tribal economy, met with challenges of the market economy. Thus the subsistence economy of tribal people was somewhat commercialized although for a long period the tribals could not derive benefits out of market economy. All through the colonial period the tribal products remained proverbially cheap due to collusion of local traders and thus tribals became mostly indebted serfs of these exploiters. The land revenue system during colonial period made the tribal situation much more vulnerable. Thus through the historic process they had been subjected to ruthless exploitation both by landlords and local traders, that brought them abject poverty. During colonial period the tribal areas became more or less opened to outside world and thus the tribal people were subordinated in their own areas, where they were *de facto* lords in earlier days.

Paradoxical situation in tribal development

No doubt, India has achieved phenomenal success in improving its static and traditional economy through successive Five Year Plans. In industry and trade, we have reached the level of developed countries. Our green revolution has brought phenomenal success in irrigated areas and substituted imports of food grains to exports of agricultural products. Yet when we read in newspapers about the death due to starvation in tribal pockets of Orissa (in the districts of Kalahandy and Koraput), the miserable picture of tribal economy becomes revealing. It is not that there is no development or progress in tribal economy in Orissa. The tribals of North Orissa have successfully improved their economy due to opportunities for work in mining and industrial sector but those tribes which are depending on their traditional economic organization can neither compete with market economy nor can retain the autonomy of their traditional economy. Due to developmental process the economic picture of the State is changing rapidly. The land of perpetual flood and famine is now having interesting multipurpose river valley projects, *viz.*, Hirakud, Machkund, Balimela, Rengali, etc. The State is progressing in mining and industrial field with the establishment of Rourkela Steel Factory and its surrounding industrial complex. In marine fishing and commercialization of agriculture the State has achieved considerable progress. But as against this backdrop the tribal economy is still in lamentable position. The modern developmental projects are indirectly affecting tribal society and they have been deprived of their land and resources. To cope with the modern economy they are working harder, but due to uncertainties of rainfall, depredation of wild animals, devastation of forest wealth, they are debarred from enjoying the fruits of their labour. Gradual loss of mixed forests and development of mono-culture forests affects not only tribal economy it has brought poverty in tribal culture.

Yet the tribal people have the scope to take advantage of the diversified economy at the present situation. Due to penetration of market into tribal areas, tribal people are able to sell their agricultural products at a competitive price. Some of the tribal products have great importance in the national economy. The nigers of Koraput are utilized in all the oil mills of North India. The turmeric, the products of the Kandhas cater to the needs of a vast population of Eastern India. The pulses and various kinds of beans have a high demand in urban areas. Better prices for tribal products has brought partial improvement in tribal economy but on the whole the production is decreasing; that is the feeling of average tribal people. On the whole modern technology has not been adopted adequately in tribal areas.

Obstacles to the development of tribal economy

The non-monetized tribal economy has now to meet the challenges of modern monetized economy. Lack of capital and improved infra-structure required for improving the tribal economy are the main obstacle to economic development. At present tribal markets are regulated through cooperatives and Lamp societies. But in Orissa such State owned commercial enterprises cannot compete with private enterpreneurs. Thus there is a conflict between tradition-oriented tribal economy and progressive modern economy based on urban centres. In this conflict, locally based primitive economy is deteriorating against the backdrop of urban economy. Here the statements of a few tribal leaders will indicate how they view the developmental process initiated by the Government.

When the Gomang of Regingtal was asked as to why they did not adopt nuclear paddy the reply came sharp "Our fields are not irrigated as in the plains areas. In spite of that if we plant rice seedlings, either these would be washed away by torrential rain or would be dried up under drought conditions. If we apply fertilizers it would be washed away to lower ingredients. Hence nuclear paddy will be never successful in our fields." The above statement shows clearly how environmental factors inhibit the adoption of modern innovations.

The Gomang of Sagada was approached by a Sales Agent of Kirloscar for adoption of pumping sets in their agriculture. The idea shocked the Gomangs who explained, "There is a lot of domestic work and agricultural work in our fields and homes. Even when we cannot cope with the demands of the present agricultural work how can we get time to work in the irrigated fields?" Here the Gomang is explaining that when domestic group is the only labour force in tribal economy the family does not like to add to its burden of work by adopting innovations however beneficial they may be.

To the question as to what they expect the Government to do, a successful Kissan farmer replied, "Just as we open the umbrella when there is rain and close it when there is no rain so also our fields should be supplied with water when we require it and it should be drained out of all water when we do not require it." The statement emphasizes the need for successful and scientific water management.

The above statement emphasizes the helplessness and insecurities of the tribal economy. Tribals now expect better technology in order to augment their productive system.

Need for modernizing primitive technology

The tribal and peasant societies of Orissa are now exposed to the conflicts between traditional forces and modern forces. The planning based on high technology at the national level helps the upper strata but the primitive and peasant societies are not very much benefited by such epoch making changes. If adequate steps are not taken at this stage the tribal societies may deteriorate beyond repair. Experience from the advanced States shows how the misfortune of primitive people starts when they face the competition from advanced sections. In the State of Tamilnadu hill slopes are acquired by plantation owners who grow cash crops such as cardamum, coffee, tea and rubber. Such commercialization of hill slopes has thrown tribal people to the status of coolies or wage earners only. To avoid such situations the modernization of tribal technology should be given priority. Economic growth of productivity should not be the sole goal in a developmental process. Raising the standard of life, and equitable distribution should be the ideology of developmental process. At present due to the extension of market economy and development of transport system, tribal products are siphoned to the distant urban areas. Thus tribal societies are depending more and more on outside markets only for their very subsistence. To eradicate the helplessness of tribal people, the Government should try to carefully study and introduce relevant technology in order to meet the local needs of the area. Every tribal village should be provided with protected drinking water and other basic needs of life. Production can be augmented through supply of electricity and other sources of energy. Research can be made to improve the tools and technology that would be more suitable for tribal areas. For the use of these new techniques the tribal youth can be trained and directly utilized in productive process. We should not entertain the misconceived notion that tribals are opposed to innovations. If adequate facilities are provided they can adopt any technology and skill with enthusiastic spirit. On the whole the planning should not be at the top. If planning is made at the local level and adequate employment-oriented technology is introduced after careful study of local needs, there will be an economic regeneration in tribal areas and revitalization of tribal economy. To achieve such a productive process the village council should be encouraged to take initiative to participate in the developmental process.

The need of the hour is cooperation between official and non-official agencies and technical specialists. Since each locality has its specific problems experiments can be conducted in selected areas and strategy for development can be chalked out through such experimental explorations. Tribal societies provide exceptional opportunity for such experiments in development. Once such experiments are successful, the strategies of development can be applied in wider areas of peasant societies of rural India.

In the present situation both the tribal and rural societies are powerfully influenced by industrial revolution. While rural society can to some extent adjust to and accommodate modern advanced technology, the tribal society is seriously handicapped due to lack of technical know-how, infra-structural facilities for adoption of new technology. All over the world, in many countries, tribal people are the victims of progress or so called development. Technologically, advanced members of modern society are exploiting the resources of tribal areas. Now the forests which sheltered the tribal people and their culture is rapidly vanishing. Roads and bus routes have entered into inaccessible tribal pockets. Thus tribal ecology is drastically disturbed or altered. At present there are two options before the planners and policy makers, entrusted with the responsibility to develop the tribal societies and their culture. Either the tribal people should be trained to adopt modern advanced technology along with continuance of their traditional age-old technology or they should be fully protected from competition with outsiders. Without such protection they would be strangers in their own locality deprived of their own resources, and ultimately turn to the status of wage-earning coolies, employed or exploited by capital-rich members of advanced societies. Hence there is urgent need for carrying out the experiments for planned introduction of modern technology in tribal areas, keeping in view the traditional technology of production which have proved their effectiveness and efficiency through long periods of their application.

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TECHNOLOGY, ECONOMIC CONSTRAINTS AND SOCIAL CHANGE AMONG THE TRIBES OF WEST BENGAL

N. C. CHOUDHURY

IN anthropology, Indian anthropology in particular, technology has not been considered interesting enough to demand for its specialized study. Yet its importance as a determinant of social life is well recoginised. In its broadest meaning technology connotes practical arts. "Technologies are bodies of skills, knowledge and procedure for making, using and doing useful things" (International Encyclopedia of Social Sciences, 1968, Vol. 15: 576). They are part of the Cultural traditions developed in human societies for dealing with the physical and biological environment.

When we study production technology of a community we generally mean two things: first we may note the significant characteristics of the technologies used, the tools and techniques used, the quantitative relations between amounts of inputs used and maximum quantities of outputs that can be physically produced, *i.e.,* the technologies-resource-output linkages and similar other allied questions. Studying technology of production of the Indian tribes from this point of view has hardly been attempted though its importance can never be ignored. In the other approach dealing with technology as a part of the productive forces (land, labour and instruments of production) and how social and other conditions, mainly economic, influence traditional technologies we are on a better ground. Most ethnographies on Indian tribal commmunities do contain a chapter or two of the system of production, various tools used, nature of control over the productive resources (land and forest) and some attempt to quantitatively determine the output. What is perhaps needed is a more incisive analysis of various productive forces and the kind of relations of production-land, irrigation, livestock, fertilizer use of new technologies etc., they generate. Our efforts in this paper will be to understand the nature of productive forces which are at the disposal of the tribes of West Bengal, particularly the larger agricultural tribes, and their relatiions with the general state of economy and society.

Tribes of West Bengal: Socio-economic features

In 1981, the Scheduled tribes population in West Bengal was 3,070,672 which shows a rise of over 25 per cent in the Population in the 1971-81 decade. The population is predominantly rural though there has been a marginal increase in the urban population from 57,344 in 1971 to 115,452 in 1981. The literacy rate has also increased during this period from 8.92 percent in 1971 to 13.21 per cent in 1981. But it is yet far below the mean literacy rate, which is 40.94 per cent, of the state. There has been some increase in the number of Scheduled tribe workers to the total workers in the State during this decade from 7.69 per cent in 1971 to 8.26 per cent in 1981.

In order to understand the economic and educational backwardness of the Scheduled tribes, which is intimately connected with the adoption of new technologies, it is necessary to have some idea about the distribution of the population in different districts and their employment pattern in the agricultural sector. This is given in the table below.

Several features of tribal distribution in the State and the basis of tribal economic become quite apparent in the above table. First, the tribal population is unevenly distributed in the various districts. Some districts—Jalpaiguri, Darjeeling, West Dinajpur, Maldah, 24-Parganas, Hugli, Medinipur, Bankura, Puruliya, Bardhaman and Birbhum do contain large tribal population ranging from over 1.00 lakh to 5.38 lakhs. The heaviest concentration is in the three districts, Medinipur, Jalpaiguri and Puruliya, which alone account for almost fifty per cent of the total tribal population in the State. Leaving aside the predominantly urban districts of Calcutta and Haora, where the tribal population is insignificant, the remaining three districts of Koch Behar, Murshidabad and Nadia also have small tribal population scattered over the rural areas.

Districtwise tribal population, literacy and employment pattern in West Bengal

(1981 Census)

District	Population	Literates	Total workers	Cultivators		Agricultural labourers	
				No.	%	No.	%
Koch Behar	10,105	1,667	3,747	1,572	41.95	1,260	33.63
Jalpaiguri	491,791	59,528	182,326	40,263	22.03	16,355	8.97
Darjeeling	151,073	37,388	58,889	20,936	35.55	6,164	10.47
West Dinajpur	260,160	28,420	105,809	43,263	44.89	57,644	54.48
Maldah	153,300	12,340	55,683	28,662	51.47	24,797	44.53
Murshidabad	45,302	3,422	20,435	4,073	19.93	15,238	74.57
Nadia	55,984	6,267	22,621	3,078	13.60	16,002	70.74
24-Parganas	189,044	24,310	71,566	15,911	22.23	40,000	55.89
Calcutta	4,420	2,126	2,134	8	—	16	—
Haora	7,280	1,528	3,960	101	2.25	1,375	34.72
Hugli	141,047	15,524	74,825	7,221	9.65	62,567	83.62
Medinipur	538,877	82,898	238,263	69.884	29.33	152,960	64.20
Bankura	250,590	43,595	105,028	50,397	47.98	46,528	44.30
Puruliya	348,375	54,620	134,431	74,370	55.32	46,788	34.80
Bardhaman	278,191	21,034	128,953	15,866	12.30	92,046	71.38
Birbhum	145,133	10,930	65,098	19,753	30.34	41,003	62.99
Total	3,070,672	405,597	1,273,768	395,358	31.03	620,741	48.73

The second noticeable feature is that the tribes of this State overwhelmingly, almost eighty per cent, depend on agriculture either as cultivators or agricultural labourers. Except in the districts of Darjeeling, Jalpaiguri, Haora and Calcutta where the majority of the workers are employed in non-agricultural occupations—Plantation, mining, manufacturing and household industries, the proportion of workers engaged in agricultural occupation in the other districts vary from 75 per cent to 99 per cent of the total tribal workers in the district. In the sphere of agricultural occupations considerable variation exists in the proportion of agricultural labourers to the number of cultivators though on the State as a whole agricultural labourers far out the number of cultivators almost one and half times the number of cultivators. In the districts of Murshidabad, Nadia, 24-Parganas, Puruliya, Medinipur, Bardhawan and Birbhum there are over 2 to 5 times more agricultural labourers than cultivators. In Haora and Hugli this difference is about 8 to 15 times. This feature of the occupational pattern, along with the sizes of the land-holdings, which we will discuss later, has considerably affected the adoption of new agricultural technologies among the tribes of this State.

There are 38 communities that have been specified as Scheduled Tribes in the State. Separate population figures for these communities are not available in the 1981 Census. The list of the communities and their population as per the 1971 census are given in the following table.

No.	Tribes	Population (1971)	No.	Tribe	Population (1971)
1.	Asur	611	20.	Kora	93,586
2.	Baiga	n.k.	21.	Korwa	3,222
3.	Bedia	3,339	22.	Lepcha	14,568
4.	Bhumij	169,476	23.	Lodha/Kharia	45,906
5.	Bhuta/Sherpa/ Toto etc.	33,912	24.	Lohara	2,388
			25.	Magh	3,257
6.	Binhor	n.k.	26.	Mahali	47,247
7.	Birjia	16	27.	Mahli	998
8.	Chakma	2,927	28.	Mal Pahariya	31,018
9.	Chero	175	29.	Mech	10,862
10.	Chik Baraik	1,627	30.	Mru	836
11.	Garo	2,623	31.	Munda	198,701
12.	Gond	46	32.	Nagesia	2,516
13.	Gorait	481	33.	Oraon	291,173
14.	Hajong	244	34.	Parhaiya	108
15.	Ho	1,036	35.	Rabha	2,466
16.	Karmali	94	36.	Santal	1,376,980
17.	Kharwar	134	37.	Sauria Pahariya	158
18.	Khoud	n.k.	38.	Savar	4,986
19.	Kisan	716	39.	Unspecified	184,586

Most of the very small tribes with population less than 1000-Asur, Birjia, Chero, Gond, Gorait, Hajong, Karmali, Kharwar, Kisan, Mahli, Mru, Parhaiya, Sauria Pahariya are scattered among the other tribal groups and are probably employed as labourers. The bulk of the tribal population is shared by a few tribes of Chotonagpur origin, namely, Oraon, Munda, Santal, Kora, Mahali and Mal Pahariya. As a matter of fact one can conveniently classify the West Bengal tribes into two broad categories. One category comprises of the tribes whose ancetors had come to this State from the adjoining regions of Chotonagpur and Santal Parganas during the colonial period. The history of their migration and gradual spread over almost in all the districts is a study by itself. The present economic condition of that tribes is a sequel of this process of migration, settlement in one place and subsequent push-out by the richer peasants and landlords. Elsewhere we have discussed in much more detail the study of tribal migration from Chotonagpur and Santal Pargana regions in West Bengal and its consequential effects on the socio-economic life of these people (Chowdhury & Bhaumik, 1986).

The other category of tribes comprises of groups who are indigenous to the State. The important tribes in this category are Bhumij in South-West Bengal and Lepcha, Bhutia, Toto, Mech, Rabha and Garo in north Bengal. Among them the proportion of cultivation to agricultural labourers is higher than that among the first category of migrant tribals.

Before we deal with the question of innovations in agricultural technology I shall discuss briefly the nature of control over resources, particularly on land, enjoyed by the tribal cultivators. There is no comprehensive study that report the pattern of distribution of land-holdings among the tribes of the State. However, one can get some idea from the figures of land reform beneficiaries given in the report of Bandyopadhyaya on land reforms in West Bengal. These are reproduced below (Bandopadhyaya and Associates, 1983: 172).

Total No. of tribal *patta* holders upto 31.12.81	253,968	(19.18%)
Total No. of tribal *bargadars* upto 31.12.81	202,649	(18.00%)
Total No. of tribal homestead plots upto 31.12.81	22,103	(18.65%)

A little less than twenty percent of cases out of the total number of cases represented the tribal interest as upto 1981. The number of tribal *bargadars* seems to be proportionately high when this figure is compared with that of the cultivators in the State.

Pradip Kumar Bose has made a socio-economic survey of tribal populations in 10 villages spread over in 5 districts—Bardhaman, Birbhum, Bankura, Medinipur and Puruliya where 52.10% of tribes live. The sample size has been 876 tribal households comprising of Santal (700), Bhumij (61), Munda (22), Lodha (47), Kora (39) and Mahli (6) households. This important study has generated a number of observations reflecting the socio-economic conditions of the tribes in this State. I shall only mention a few of his observations as may be relevant to this paper. The study finds that:

(1) of the total land owned by the tribals (1357 acres) 40.8% are *danga* and rest are low land placed at various level; very low land constitute only 10% of the total land held

(2) 22.8% land are irrigated by canals, 2.9% by tanks
(3) land taken on lease constitute almost half of (627 acres) owned land
(4) principal crop is paddy; wheat (5.3%), potato (2.6%) and maize (9.6%) are marginally grown
(5) seeds used are of traditional variety, only 2.9% of landowners use high yielding variety seeds
(6) implements are of old types, only a few well-off peasants own pump-sets
(7) quality of cattle is very poor-average number of bullocks owned by tribals come to 1.34 and average number of cows to 0.42
(8) of the total households, 1.1% are rich peasants, 6.6% are middle peasants, 68.2% are poor peasants and 24.1% are agricultural labourers
(9) The characteristics of different classes as mentioned in the study are:

	Mean land owned (acres)	Land irrigated (%)	Mean Plough animals	Chem.fertilizers Kg/acre	Cow-dung
Rich peasants	22.41	44.26	5.00	19.00	9.80
Middle peasants	5.30	26.61	3.70	8.36	7.86
Poor peasants	1.32	22.07	1.50	2.03	3.39

This succinct picture of tribal economy clearly explains the reasons for tribal backwardness in the field of agricultural development. An overwhelming number of peasants are poor with very samll holding and due to this economic constraint they are unable to use much of new agricultural inputs. Whereas all the rich peasants could get agricultural loans and subsidies only 42% of middle and 3% of poor peasants and agricultural labourers could get some benefits from government and other agencies (Bose 1985: 29-40).

In a study conducted about 30 years ago among the Mundas in 3 villages in the Sunderban area of South Bengal it was found that out of 122 Munda households only 2 belonged to the well-to-do category, 39 to poor peasants and the rest 81 households depended entirely on agricultural labour. All these households together held 95 acres as own land and 186 acres as share-croppers (Chaudhury, 1961: 89-90). The per household land holding comes to less than two acres including both the categories of holdings.

The economic profile of the indigenous tribes is perhaps a shade better. No communitywise land-holding figures are available but one can safely assume that being the original inhabitants in the once sparsely populated hill and forest areas of North Bengal they would have more control over land resources. In Darjeeling district where the Lepcha and Bhutiya are mostly concentrated the percentage of cultivators is 35.55 as compared to 10.47 percent of agricultural labourers. In one study Ray, Das and Choudhury report that among the

Lepcha working population 34.01 percent are cultivators and 27.58 percent as agricultural labourers (1982-112). Among the Mech found in Koch Behar and Jalpaiguri districts the number of cultivators is also quite high in proportion to the number of cultivators. In one study conducted by the students of North Bengal University in 1978 in a village in Koch Behar with sizeable Rabha population it was noted that quite a number of affluent Rabhas held land between 5 to 15 acres and the proportion of landless Rabhas was very small. But these are isolated cases and need not reflect the true economic picture of the community.

Technology of production

The tribal cultivators of this State do not show any special feature in their production technology related to agriculture. Wooden plough, bamboo ladder or wooden plank used for harrowing, rake, bamboo or wooden club used for clod crushing, spade, garden spade, sickle, scythe (*Hasua*) and yoke are the common agricultural implements. The shape of an implement more or less adheres to the pattern prevailing in the region and used by all the cultivators in general. For instance, the plough, consists of a single piece of wood, with the body, shoe and handle forming a continuous piece. The heaviness of the shoe and the angle between the shoe and the body vary from one area to another. The weight of the plough is lighter in the Southern part, where the soil is soft and loamy. But in the Northern districts the soil being gravelly and sandy a heavier plough is used. Similar region differences in shape and size of smaller agricultural tools may also be noticed.

In the hill regions of Darjeeling terrace cultivation is practiced for obvious reasons. It may be noticed that the terraces are better maintained by the Nepali cultivators, often with a stone wall, than the Lepcha cultivators with the result that the erosion of top soil is higher in the latter case. It has been reported that the Lepchas were originally shifting cultivators and they have learnt the technique of terrace cultivation from the Nepalis. The size of the terrace, which may at times be very narrow and small especially on the steeper incline, naturally restricts the use of plough and bullocks. Here the spade becomes the main implement to turn the soil. This topographical feature of the region limits the application of new agricultural tools.

Irrigation is an important input in agricultural operations. As it is, compared to other States the proportion of net irrigated area to the net sown is area is quite small in West Bengal. In 1978-79 it was only 26.9 per cent of the net sown area (Vaidyanathan, 1987: 26). About the tribal cultivators of the State no separate figure of use of irrigation is available. But study of Bose mentioned above shows that in the 878 tribal housholds surveyed by him in 10 villages wider variation exists among these cultivators in their use of irrigation factilities. The rich peasants irrigate 44.26 of their land. This percentage falls sharply to 26.61 and 22.07 in the case of middle and poor peasants. In a survey of 4 blocks in the ITPD areas of Jalpaiguri district it was found that though a substantial assistance (about Rs. 4.00 lakhs up to 1982) has been rendered to the tribal cultivators for minor irrigation scheme their impact has been marginal. Either these facilities were found inoperative at the time of the survey or they were not properly used. In two instances pump-sets given to the cultivators could not be used due to their ignorance about its mechanics.

In the hill sides of Darjeeling the tribal cultivators have more non-irrigated land than the irrigated ones. Speaking of the Lepchas Das notes, "majority of the cultivating families have small land holdings, most of which are *sukhakhet* type, *i.e.* dry land. Possession of *panikhet* (wet land) is meagre" (Das, 1987: 109).

The traditional variety of paddy is the principal crop grown. Only 2.9 per cent of tribal farmers use seed of high yielding variety. Maize is an important crop in the hill areas. Wheat, potato, oil seeds, jute and vegetables are marginally grown mostly for domestic consumption and a little cash to meet other expenses. None of these crops are grown on a large commercial scale. The use of chemical fertilizers is largely limited to rich and middle peasants. Even that is also at a much lower rate that what is required, as given in the report of Bose mentioned above, to reap a good harvest. If the majority of tribal cultivators (over 70 per cent) are poor with land-holding of a little over one acre the extent of application of new agricultural technology has been severely limited. In the use of cow-dung as natural fertilizer the difference is noticeable between rich and poor peasants. The rich peasant put three times as much of cow-dung as the poor peasants do in per acre of land. Naturally this affects the productivity rate or the piece of land in question.

Social change

In the pre-Independence era the Hindus formed the usual reference model to understand the processes of social and cultural change among the bulk of the tribal population. But this Hinduization model is hardly valid in the context of the present socio-political situation. It does not held us to understand the dynamics of the secular processes of change that are taking place among these people. It is not within the scope of this paper to examine aspect of social change among the tribes in any length but can only be marginally touched upon as a corollary to the economic condition of the people.

Seasonal migration of tribal labourers to work in villages during agricultural season is quite frequent in West Bengal. At one time when the tea-gardens in North Bengal encouraged employing tribal labourers of Chotonagpur and Santal Pargana origin a large number of labourers from these regions and other parts of West Bengal used to go to Jalpaiguri and beyond in search of employment in tea-gardens. But since 1960's tea-gardens have stopped employing outside labourers, except on casual basis in the plucking season, the migration to these centres has substantially reduced. However, in the rural areas, particularly in the southern districts, Maldah and West Dinajpur, this form of rural to rural migration of tribal labourers continues unabated. This form of migration can be seen as a function of economic condition of the people. Landlessness due to eviction, land alienation, distress sale and such other causes have forced the people to move from one place to another. It is probably for this reason in the more agriculturally developed districts of Bardhaman, Birbhum, Medinipur, Hugli, Haora, Nadia and Murshidabad the bulk of the tribal population, which is substantially high , are agricultural labourers who come here in search of jobs during the agricultural season. There is good demand for tribal workers as the employers think them sincere and adept in cultivation techniques.

The periodic, if not constant, movement of the people from one place to another has had a telling effect upon the social life of the people. Community life in the traditional sense could no more be sustained. The bondages of the family, clan and lineage have become loose. Adoption of Hindu cultural idioms in the sphere of religion has been easy especially where the tribal population is widely dispersed. In many areas they have been lost their language (Choudhury, 1961). But the tempo of adaptation is guided by the local conditions and the number of the tribals in the larger context of the area.

Education is considered as an important index of social development. In general the literacy rate among the tribes of this State is very low 13.21 per cent as against the State average of about 41 per cent. But within the tribes as such wide differences have been noted in the educational achievement according to their economic status. The study of Bose shows that all the rich peasants in his sample households (878) send their children to school, whereas this percentage drops to 73.7 for middle peasants, 31.6 for poor peasents and 12.6 for landless labourers (Bose, 1985). This situation has naturally helped to create an educated and relatively affluent class among the tribes. Effect of education on agricultural development is hardly discernable as most of the educated persons prefer to take up services and other non-agricultural jobs. Even otherwise, a direct correlation between the two cannot be firmly established.

The agrarian structure as has been described above clearly points out a distinct concatenation of the tribal population into rich, middle and poor classes based on land, income and lobour utilization. This is not to say that these tribals have developed these classes only in the resent years. Class formation among the tribals of this State has probably a long history, colonialism, land alienation, migration and distress sale are important factors which had contributed to shape the present political economy of the people. As has been noted by Pathy, alienation of tribal land was more serious in Zamindary system because of appointment of a hierarchy of tribute collectors and also in ryotwari areas which developed substantial cash crops with the result that the tribal labour became mobile (1985: 15-27). Whatever may be the background, a fuller exploration of which is needed, presence of a distinct class structure among the tribes of this State as a function of economy cannot be overlooked. Education has further helped to polarize the tribals into rich and poor classes. This section of small, but affluent and educated class of tribals is likely to exert considerable socio-political influence over their poorer brethren. Commenting upon the class relations between rich and poor tribal peasants Bose observes, "the poor tribals now tend to view the richer classes even from their own tribe as a group whose interests are in conflict with theirs and this is expected as they are exploited by both tribal and non-tribal rich peasents alike" (1985: 39).

A concomitant feature of agricultural modernization is that it is becoming more and more capital intensive and market oriented. Though the Government has initiated a number of schemes to help the poor tribal peasents it is the more affluent section that has been most benefitted. If this trend continues the dichotomy between the rich and poor peasent will become sharper. From this point of view the tribal peasantry can hardly be viewed as a separate category.

It has been suggested that the emerging question of tribal identity in the context of inter-tribal political movement, we are referring to Jharkhand movement, must be understood from this non-identical economic class interest. Bose remarks, "though the 'tribal identity' is often projected in the context of different protective and developmental measures, on closer inspection this 'identity' turns out to be an illusion. This is the same kind of manipulation by upper class tribals in ethnic symbols and idioms to help their own interests as one finds among the other minority groups in India" (1985: 4). This observation though may seem harsh and debatable perhaps it gives a better framework to understand the internal dynamics of the tribal polity.

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ECOLOGY, ECONOMY AND SOCIETY AMONG THE WANCHO OF ARUNACHAL PRADESH

SACHCHIDANANDA

I

NOWHERE is the close inter-relationship between ecology, economy, technology of production and society better visible than among the Wancho, a swiddening tribe, in the Tirap District of Arunachal Pradesh. They number close to 30,000 and inhabit the Longding sub-division in the extreme South-western part of the district. The entire area is rugged and mountaneous. It is dominated by the Patkoi mountains which separate the district from Burma and Nagaland. The mountain descends into plains in the West through a series of hills. Vegetation on the whole is tropical evergreen, rain forest type and semi-evergreen depending upon the altitude and soil condition. There are hardly any grass lands. There are some shallow lakes in this area formed by old beds of meandering rivers. These lakes have now become natural fisheries. Besides the rivers, the springs are the main sources of water supply in the village settlements.

The flora of the district is rich in variety. The vegetation in the area consists largely of tropical and sub-tropical evergreen forests and temperate forests in the high hills. The hills rise to a height of 5,000 feet. Most of the land is situated on steep slopes in which no cultivation other than swiddening is possible. The fauna of the area is equally rich and varied. Water fawls and ducks are commonly found in the river water of the pools. On the hill slopes the spotted dove, hornbills, patriges are found. The sambhar and deer, mithun and wild boar live in the grassy and bushy jungles, various type of rats and squirrels add to the diet of the tribals. It is an area of heavy rainfall, the bulk of which is received from June to October. In most areas winter is quite harsh.

II

Swiddening represents a distinct stage in the history of man's exploitation of his environment. This method of cultivation is also known as 'slash and burn' cultivation or shifting cultivation. According to the Food and Agricultural Organisation it is defined "as the custom of cultivating clearance scattered in the reservoir of natural vegetable (forest or grass or wood lands) and of abandoning them as soon as the soil is exhausted and this includes in certain areas the custom of shifting homesteads in order to follow the cultivators searching for new lands." In India in 1974-75 it was estimated that the estimated area under shifting cultivation was 13,263 sq. kms. and the estimated population primarily or partially depending on shifting cultivation was 36,06,000 persons. In Arunachal Pradesh alone, a very large population depends on shifting cultivation. However, swiddening differs from area to area according to the agro-climatic conditions, ownership of land and the critical limits to the period of the jhum cycle. If the cycle of shifting cultivation in an area is longer than the critical period the natural regeneration can be expected to be satisfactory and in such an area swiddening is sustainable in the long run. The agricultural period of jhum cycle depends on a number of factors including the slope of the land, texture of the soil, the extent of rainfall, the natural vegetation of the areas, the crop mix, intensity of cultivation etc.

III

Swiddening presents a near ideal multiple choice economic system. The jhum field and the surrounding forests provide two alternative sources of subsistence. If the jhum crops failed the forest could be tapped for food supply. However, swiddening provides a built-in cushion. Pig rearing is generally associated with swiddening. The pigs feed on the vegetable waste arising from the jhum and supplemented by inferior grains. It provides a practical method of conserving the surplus produce and storing it in animal farm. The pigs function as a buffer stock of food supply and can be drawn upon to the extent necessary during the periods of scarcity. This is not only found among the Wancho but among other tribes in the north-east and among the New Guinea Swiddeners.

Multiple choice can also be seen in the utilisation of the jhum field itself. The sowing and harvesting of crops are spread over the long period. The Wancho remain busy in agriculture for the whole year except for two months, May and June. At this time they generally undertake other pursuits like selling their surplus grains or arts and crafts in the plains or in nearby markets. Alternatively, they are engaged as daily labourers wherever work is available. Their annual routine of agricultural activities and the main crops they grow are given in Table I and II.

TABLE—I

Calendar of Agricultural Activities

Months	*Major Activities*
January	Preparation of field and sowing of millet and maize seeds. Planting of arum and tapioca.
February	Preparation of field for ahu-paddy. Sewing of millet and maize seeds and planting arum and tapioca continue.

TABLE—I *Contd.*

Months	*Major Activities*
March	Sowing of ahu-paddy seeds starts. Planting of tapioca continue.
April	Sowing of ahu-paddy seeds continue.
May	No agricultural activity for men. Women take up weeding of paddy and millet.
June	Same as in May.
July	Harvesting of millet, maize and arum starts.
August	Harvesting work continues.
September	Harvesting of paddy and tapioca starts.
October	Harvesting of paddy and tapioca continues. Preparation of field for millet, arum, tapioca and maize starts.
November	Harvesting of tapioca continues.
December	Preparation of field for paddy starts.

TABLE—II

Cropwise Agricultural Operations

Name of Crops	Preparation of field	Seed Sowing	Harvesting
1. Paddy	December to February	March to April	September to October
2. Millet	October to mid January	Mid January to mid February	Middle of July to end of August
3. Arum	-do-	-do-	-do-
4. Tapioca	-do-	February and March	September to November
5. Maize (Corn)	-do-	Mid January to mid February	July/August

The Wancho do not use any insecticides or pesticides since crop diseases and pests are very rare. The main reason of this is the burning of jhum fields before sowing. However, once in a while the plants are attached by pests. In such a case, the Wancho collect them in bamboo tubes and burn them.

In most villages harvesting is done by hand. Grain is pulled out of the plants. In some villages small knives or *dao* are used. Proper sickles are not known. Threshing is not required if the grain is pulled out by hand. In other cases, threshing is done by trampling on plants near the farm house or on a piece of ground cleared for the purpose. This work is only done by men. After threshing, the grains are brought home in conical bamboo baskets and stored in granaries. Some of the grains are preserved for next year's sowing. To save the seeds from insects they are thoroughly dried in the sun before storage.The seeds are stored in old bamboo tubes or earthen pots.

IV

Swiddening represents an intricate web of relationships, ecological, economic and social. It has been reinforced as a system continually with experience of the people practising it. It has been enriched by the exuberant spirit of the people living in close proximity with nature. The village community is largely self-contained. They have learnt through experience that all years may not be equally good for food production. Therefore, all the families invariably keep their surplus for future use and generally maintain a stock of grain to tide over the drought period. However, the surplus cannot be retained for many years and there are institutional mechanisms for the consumption of the surplus through periodic fairs and festivals.

The Swiddeners have learnt through experience to use natural resources to their maximum. The mix of crops sown in the jhum field is so evolved that the root systems of different plants reach to varying depths. In this way, different crops are able to use the nutrients of different layers of the soil in the field. The variety of plants in the jhum system are arranged in such a way that leaf area of all vegetation in the field taken together is very large. This helps in harvesting solar energy much more efficiently than in a mono-crop area. The different crops in the jhum fields have diverse growth habits and requirements. For example, maize is harvested at a time when paddy plants are at their peak and require more space. The older crops also leave plant debris which begin to decay and provide organic matter and nutrients in standing crops. It is significant that the labour requirements for sowing, protection and harvesting for the variety of jhum crops taken together is evenly spread over a long period. It helps in intensified use of natural resources notwithstanding the limited man power in these sparcely populated areas. Among the Wancho we have a harmonious blending of the social system of the tribal people with the swiddening economy. There is no individual ownership of the swidden fields. All the lands belong to the community which is symbolised by the Chief. However, the Chief is not the owner of land although he has a final right of disposal which he does in the interest of the community. The individual holding can be transferred, alienated, sold or mortgaged or given as a gift by the owner only to a person belonging to the same village. No land can be transferred to an outsider or even to a Wancho not belonging to the village. If any land is required to be transferred to a person other than the members of the village, such a decision can be taken the community as a whole and not by any individual whatever may be his social position. Such village has several plots of jhum land which are cultivated in turn. The jhum cycle is around 9-10 years depending on the number of fields. Each field is cuiltivated for two successive seasons. In the first season, millet is sown and in the second, paddy. Individual plots are given to each household in each jhum field. The chief's plot is usually the biggest and the best. Those who have no plots of land in the jhum field, cultivate on lease basis.

The arduous cutting and burning of the Swidden are undertaken by men while clearing and preparing the field for cultivation are primarily the tasks of women. Each agricultural operation is preceded or followed by some rituals. The millet being the most important crop has a large number of rituals attached to it. Seeds of millet and paddy are sown broadcast while for the other crops, seeds are put in holes made with digging sticks. Sowing is done by experts called *Haipa*. It is always done by men and women are excluded from this operation. In the newly prepared fields, millets, arum, pulses, chillis, ginger etc. are cultivated and in the previous years' fields paddy and other crops are grown. Arum is planted with millet in the same field along with pulses. Sesum seeds are sown along with millets in the new fields.

V

Shifting Cultivation Control Programmes have been in operation in several areas in this region. However, tribals have not been attracted by this idea. The bulk of the swiddeners have been used to the system for generations and are not aware of the adverse effect of swiddening. They feel that in the circumstances there could be no other means of livelihood except this. Since land is not individually owned, an individual would not like to go in for innovations unless everyone else does so. So the change over from swiddening to horticulture has not taken place. The land tenure system is, therefore, stumbling block in the adoption of new technology and of new crops which may augment their income. It is also not possible to resettle the swiddeners on plain land since so much land is not available. Under these conditions we can only think in terms of in-situ development.

Swiddening has become a problem since the concerns of the wider society are impinging on the life of people living in little communities. Hitherto these little communities have been largely isolated from the larger populations. With the development of communications and the consequent progress of integration of the little communities with the wider society, it is no longer possible for people in simpler societies to carry on their activities in a way as if they existed in a closed society. In the areas where swiddening is done there are enormous forest resources which are no longer considered to preserve the communities who live nearby. They are regarded as the wealth of the nation to be preserved for the posterity. However, in order to protect forests, instead of banning swiddening altogether active steps need to be taken to strike a balance between claims of wider society and the interest of little communities. It seems, therefore, that it is neither possible nor desirable to do away with the swiddening among the Wancho.

For a long time the Wancho have lived in complete harmony with their ecology. Ecology determine the technology of production and the social and political structure of the community supported it. However, on account of the opening up of the area to outside contact, new forces of change are emerging. These forces tend to destabilize the established harmony. New challenges are appearing with the reservation of forests, growth in population, changing ownership patterns and communication and specialization. Among the Wancho land has not been surveyed and the commercial ownership is the general rule in the hills. In areas close to river beds some flat land is available. Such land is individually owned and wet rice cultivation is practised there. In other areas, no change in the technology of production is visible. Some people have taken to subsidiary occupations. Education and outside contact have created the vision of a new and better life among the Swiddeners and they wish their children to strive for it.

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SHIFTING CULTIVATION : AN APPRAISAL WITH SPECIAL REFERENCE TO NORTH-EAST INDIA

R. K. KAR

Introduction

AGRICULTURE is that sector of human activities in which there is the greatest interaction between environment and culture. It also represents the basic relationship between man and land that was initiated in the obscure past. Smith (1953 : 324) maintains that agriculture includes an integrated set of ideas, culture, traits, skills, techniques, practices, prejudices and habits employed by the members of a given society for extracting a living from the soil. Saha (1963, 1968, 1970, 1973), Saha and Barkataky (1969), and Saikia (1968, 1969) observe that the system of agriculture is, "the reflex of the physiological, cultural and economic conditions of a given community". If we look back to the distant past, we find that agriculture systems have passed through a number of distinct evolutionary stages (Chart-I).

We know that the climatic condition throughout the world is not uniform. In the Arctic zone, the Kakimos do not get land for cultivation, nor do they get other materials for constructing houses and weaving clothes. They get sustenance from animal meat, cover their bodies with animal skins, and use transport (sledge) drawn by dogs and reindeer. Thus, life in that zone is very hard, and fertility and mortality being high, the population remains almost stagnant.

In the tropical hard-wooded forests of Africa, Central America and Asia, we find that the scope of agriculture is very limited. The inhabitants, therefore, have adopted hunting and gathering as their mainstay.

In the deserts of Central Asia, the Beduins lead a predatory life, occasionally robbing of the more advanced neighbouring communities.

In the sub-tropical forest all over the world live communities who began their lives as hunters and gatherers, but with the pressure of increasing population, in course of time, have switched over to shifting cultivation.

In the history of human civilization, shifting cultivation possibly is the first step towards purposeful use of soil for crop production. It seems to have been well established during the neolithic period more than 10,000 years ago. It was satisfactorily suitable for the humid tropical forest where vegetation regenerates very fast. The technology provided an appropriate combination of conditions for the man and was able to support the growing population for a long time.

In course of time, in many areas, as noted earlier, people have now adopted settled cultivation. But, even to-day a substantial area in the tropics continues to be under shifting cultivation.

In the present paper, an appraisal has been made of shifting cultivation with special reference to North-east India. Discussions have been made on the extent, pattern and economics and anthropology of shifting cultivation. The paper also attempts a brief appraisal of the necessities and problems of controlling this system of cultivation.

Extent of Shifting Cultivation

Africa seems to account for the biggest land area under shifting cultivation (Schlippe 1956)* followed by Latin America (Steward 1950)*. It also continues to be the mainstay of economy of the hill people in the South and South-east Asia where the pressure of population has significantly increased in the last one century. It is practised by about 12 million households over 264 million acres in this region alone (Vitebsky 1983)*. In our country also shifting cultivation was prevalent in most of the tribal areas till about hundred years back. Many of these people, however, have now graduated to settled agriculture.

There are certain distinguishing similarities about the practice of shifting cultivation all over the world (Goswami 1985).

These are:

(i) Land under shifting cultivation is usually owned communally.

(ii) Fields are demarcated for successive annual operations; there is no permanent boundary or right of possession or ownership over lands.

(iii) The plot or plots to be cultivated in a particular year are jointly cleared and only after burning the debris the families divide among themselves the individual plots.

(iv) Crops are generally grown mixed and a variety of crops are raised from the same plot, And

(v) Sometimes, along with the shifting of fields, villages may also shift, or when villages are not shifted workers in the field may temporarily live in the watch-houses in the field itself.

Shifting cultivation is widely practised in the hill areas of North-east, Southern Orissa and Northern Andhra Pradesh. It is the mainstay of the local tribal economy there. It is also prevalent in isolated pockets in M.P., Maharashtra, Bihar, Kerala and Tamil Nadu. In the North-east it is generally known as *jhum*. Various groups of people, however, have their own nomenclature for it.

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* Cited in Sharma (1984 : 2)

Till now no comprehensive survey has been made to ascertain the extent of shifting cultivation in India. No accurate data about the number of people practising such cultivation, contribution of such cultivation to the over-all economy of the hills, yield rate of crops on *jhum* fields are available. Nevertheless, from cursory observations and micro-level field investigations it is seen that shifting cultivation is a major problem in Orissa, Madhya Pradesh and in the States of North-east India. In areas where there is concentration of scheduled tribes, the custom of shifting cultivation is also prevalent. The ideal place for this cultivation is the gentle hilly slopes. But with the increase in pressure of population and need of new land area for extension of cultivation, shifting cultivation has been extened to medium slopes or on the hill-tops also, Sharma (*op cit,* 3) has provided us with some estimates according to which 618 thousand hectare of land was under shifting cultivation during 1960-61, and 1326 thousand in 1974-75. The total population depending on shifting cultivation during those years were 33 lakhs and 36 lakhs respectively (Table 1). It is apparent from the table that the area under shifting cultivation and population dependent on it have gone up in all the units in the North-east and Orissa. In other States it has either declined or disappeared.

At present, it is estimated that about 4.33 million hectares of land are subjected to shifting cultivation in the country, and about 6.22 lakhs tribal families are practising this type of cultivation over a million hectares annually.[1]

Pattern of Shifting Cultivation

Shifting cultivation is also known as 'slash and burn cultivation'. Food and Agricultural Organization defines it as, "the custom of cultivating clearings scattered in the reservoir of natural vegetation (forest or grass or wood lands) and of abandoning them as soon as the soil is exhausted and this includes in certain areas the custom of shifting homesteads in order to follow the cultivators' search for new fertile lands."[2]

The essential feature of *jhum* cultivation is to clear the natural vegetation and burn the forest debris and dibble seeds in the clearings. After two or three years when the fertility of the soil is exhausted due to erosion of top soil, the field is abandoned and farming is started in a new area, leaving the previously cultivated area for growth of fresh vegetation. The characteristic features of *jhum* cultivation are:

(i) Rotation of fields rather than crops;
(ii) Use of fire for clearing and preparing land;
(iii) Use of human labour as chief input;
(iv) No use of draught animal, plough or machinery;
(v) Use of simple implements (eg., dibble stick, dao and chopping knife etc.); and
(vi) Shifting of household, if necessary, when the new area is opened in distant places.

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[1] *The Hindu,* May 5, 1987.
[2] F.A.O. paper, 1957 (Quoted by Borthakur *et al* 1976 : 85).

Usually *jhum* land is selected in November and December in the hill slopes. Hill slopes are selected because (i) it is easy to get land on slopes, (ii) easier to clear the land, (iii) there is no danger of water-logging, (iv) greater area can be found diagonally, and (v) easier to watch the fields from villagers' residences situated at the hill slopes on higher level. During the following two months, in January and February, tall grasses on the land are cut and left on the ground for drying. In the last part of March or early April when cuttings are dried, the debris is burnt. After one or two showers when ash settles down on the soil, the cleared area becomes fit for sowing of crops. The soil is not ploughed or upturned. Seeds of several crops are put into the holes made by dibble sticks or sharp knives. Seeds like paddy is broadcast. Sapplings and sets of few others like pineapples are planted. Sowing and planting continue during April and May. Table 2 shows the annual routine of agricultural activities of the Wanchos of Arunachal Pradesh. It will be seen from the Table No. 2 that the Wanchos remain busy in their agricultural work almost for the whole year except for two months—May and June.

Weeding is a continuous process and is done regularly. Harvesting of crops starts from the third month after the sowing. Maize is harvested first in June-July, millet in August, paddy in September, and ginger and turmeric are harvested in November-December.

A plot of land is used once or twice (i.e. for two consecutive years) and then left fallow from the second or the third year depending on pressure of population and the land available for such cultivation. The period of crop and the period of fallow vary from area to area, but the *jhum* cycle is usually between 4 and 10 years. To have a productive cultivation, the cycle should not be less than 10 years. This means that after the abandonment of *jhum* land at the end of second or third year, the land would remain fallow from 8 to 10 years and only after this recuperative period land will again be used for fresh cultivation. *Jhum* cycle is thus the period of rest allowed to the land for recoupment of its fertility. It is estimated that the *jhum* cycle in Arunachal Pradesh is 8 years, in Karbi Anglong 10 years, in Garo Hills 6 years, and in Mizoram 8 years. With the narrowing down of the *jhum* cycle, the land cannot replenish its fertility and hence the productivity decreases. Chart II shows the *jhum* cycle in a Wancho village in Arunachal Pradesh. It will be seen from the chart that on the 10th year they again return to the first field, and thus one field remains fallow for 8 years. To avoid confusion they have specific names for the fields remaining fallow for specific number of years. The people believe that if the cycle is broken the wrath will fall either on the Chief or on the priest (*Ngopa*) and either of them will die. Among the Tangams of Arunachal Pradesh, all the cultivable land belonging to a village is divided into a number of sections which are known as *Patats*. Each *patat* is cultivated for two years. Then it is given up to lie fallow for 10 to 15 years. Each *patat* has its special name and by the name of the *patat* under cultivation people are able to say which year it is in the *jhum* cycle (Bhattcharjee 1975: 36).

The chief tools and implements used in *jhum* operation are dao, axe, adze and bamboo-basket. Kumar (1979: 75-78), while working among the Pailibos of Arunachal Pradesh observes that the people have been using the few implements that their forefathers invented and used for agricultural operations. These implements have not been improved in anyway but have remained in their crude shape and form. The following may be listed as the requisite implements used by them:

(i) *Oyke:* It is the common dao used for various purposes. In agricultural operation it is used for cutting the jungle growth, for digging earth and making holes for planting seeds, for weeding and then for harvesting also.

(ii) *Ame-bangi:* It is the digging stick made from a long pole of any hard dry wood with a pointed end. They sow maize only for which it is used in digging holes in which the sower puts the seed.

(iii) *Lyik:* It is a bamboo scraper made to the size suiting the user. It is sharpened to an edge in the middle, and then the two ends are made to cross and form a loop. When operated, it is held in the hand the loop is placed in such a way that the sharp edge is at the base of the wild growth to be removed. With a slight jerk of the hand the weed is removed.

(iv) *Yokchik:* It is a small size knife which the woman uses for harvesting.

(v) *Eg-gvi:* It is the felling axe. It is mostly needed for cutting tree trunks which cannot be dealt with the dao.

(vi) *Egin, Pap-nara* or *Ekken:* These are big baskets made of bamboo and lined with plantain leaves when to be used. Harvested grain from the field or the field-hut is carried in these baskets to the granary.

Economics and Anthropology of Jhum Cultivation

Shifting cultivation presents a multiple-choice economic system of the early days. The *jhum* field and the surrounding forests provided two alternative sources of subsistence to the people in this system. If the *jhum* crops were not good, the forests could be tapped by them for augmenting their food supply. Further, it has been observed that the swine husbandry is an integral part of the shifting cultivation. The pigs largely feed on the vegetable waste arising from the *jhum* supplemented by inferior grains and other by-products of the system. Swine husbandry provides a practical method of conserving the surplus produce and storing it in animal form. The swines function as buffer stock which can be drawn upon to the extent necessary during periods of scarcity. Sometimes they are used on special occasions for celebrations. On the whole the swine husbandry emerges as a major component of the shifting cultivation economy.

Besides, the multiple-choice principle is also seen in the large varieties of crops grown under the system. On North-east India paddy is by far the most important cereal crop, followed by maize and different types of millets, pulses and beans, mustard, and sesamum, sugarcane, cotton, yams and sweet potatoes, chillies, ginger, turmeric, pineapples and many other kind of fruits and vegetables. Table 3 contains the major crops and the connected agricultural activities taken up in different months by the Wanchos of Arunachal Pradesh.

Jhum cultivation depends entirely on distribution of rain and moisture retention power of the soil. The wide stretch of the sowing season and the variety of crops grown are an insurance against the uncertainties of rain both in terms of the total quantity and its seasonality. In the year with ideal distribution of rain, the shifting cultivator may have a really bumper crop.

Moderate changes in the distribution of rain do not affect him significantly. Unless rains fail completely throughout, the cultivator can count on one or the other crop being good providing him minimum sustenance which can be suitable supplemented by reserves in the swine husbandry and collection from the forests. Shifting cultivation in this frame seems to provide full security against vagaries of nature.

Scientific studies on *jhum* cultivation practices have shown that in many ways there is optimal utilisation of natural resources in the system (Sharma, *op. cit.,* 6) Firstly, the mix of crops grown in the *jhum* fields is so evolved that the root systems of different plants reach out to varying depths. In this way different crops are able to use the nutrients of different layers of the soil in the field. In contrast, all plants under mono-culture systems draw up on the same strata. Secondly, the variety of plants in the *jhum* system are arranged in a multi-storeyed pattern so that the leaf area of all vegetation in the field, taken together is extraordinarily large. This helps in harvesting the solar energy much more efficiently than in a mono-crop area. The multi-storeyed pattern also provides a better cover for the land against soil erosion. Thirdly, different crops in the *jhum* have diverse growth habits and requirements. For example, maize is harvested at a time when paddy plants are at the peak of their growth and require more space. The older crops also leave plant-debris which begin to decay and provide organic matter and nutrients for the standing crops. In this way shifting cultivation is able optimally to utilise the micro-climatic variations and the natural seasonal changes with the mixed cropping of mutually supporting and non-competitive species. Lastly, it is significant that labour requirements for sowing, protection and harvesting for the variety of *jhum* crops taken together is evenly spread out over a long period and is not clustered.

Under shifting cultivation human labour and land are the principal factors of production. Capital in the form of tools, implements, machineries and finance is non-existent. Organisation plays a very minor role. There is practically no hired labour. Family labour supplies the necessary motive power for all purposes and hence there is little room for organisational measures or management for allocation of resources. The principal handicap of the system is that it requires more land than under settled farming.

In the *jhum* land it is difficult to estimate productivity per hectare easily. From several village survey reports of the Agro-Economic Research Centre for North-east India, Assam Agricultural University, Jorhat dealing with hill districts of North-east India, it is seen that where *jhum* cycle is less than 8 years, as in Garo hills, the yield per hectare is around 8 quintals, but where *jhum* cycle is more than 10 years, as in certain parts of Karbi Anglong, the yield is up to 11 quintals per hectare. The yield, however, decreases in the second and subsequent years.

Now, if we look into the social system of the tribal people we find that shifting cultivation economy and the traditional social system have got harmoniously blended. In fact, besides providing the economic base for the community, *jhum* acts as a strong binding force for community life. We know that the concept of territorial rights and exclusive command of the community over the resources therein had developed at a very early stage in the history of man. This principle has remained more or less inviolable in all communities practising shifting cultivation. The individual has only usufructuary right over the field which he cultivates for a limited period.

An important characteristic of shifting cultivation is the community action and participation in the entire economic activity in the relevant area. The social organisation of the people is built around the concepts of community ownership, community participation and communal responsibility.

Besides, many religious customs, ceremonies and festivals amongst the tribal people are linked with shifting cultivation. There are special ceremonies at each stage of the agriculture cycle (e.g. selection of field, clearance of *jhum* land, sowing of seeds and harvesting of products). Even in case of illness, spirits and gods are to be satisfied in the *jhum* field.

Thus, the economic and social aspects of man's life are indistinguishably intertwined. Further, in the system, there is the highest concern of the community for the well-being of all its members. The elders are appropriately responsible for decision-making and for performing intricate rituals spread throughout the year. The youngers, on the other hand do the physical labour according to their capacities.

The Problems of Jhum and its Control

The foregoing discussion makes it apparent that the *jhum* system has been in complete harmony with nature as also within itself. It has provided the base for a happy and self-contained life for small human bands for thousands of years. These people in the hills were unaffected by the rise and fall of civilisations in the neighbouring plains where gradually a different base of economic life had been established. But, the situation has now changed.

Despite all the favourable factors for *jhum* cultivation described earlier, because of pressure of population and progressive deterioration of soil in the hill slopes, it has become difficult to get suitable *jhum* land on hill slopes. Extension of *jhum* cultivation in steep slopes will aggravate the problem of soil erosion and the agricultural prospect in hills and plains will be jeopardized.

The forces of modernisation and process of fast change, and an acute pressure of increased population have brought to relief the relative inefficiency of this form of agriculture. Besides low productivity, this system has been held responsible for disturbing ecological balance by causing disproportionate deforestation. This in turn has been causing huge soil erosion in the areas where this system in practice.

Soil erosion, the quite crisis not widely perceived but gradually unfolding as the greatest man-made disaster, has serious social and economic consequences. Directly affecting the people, especially those in the lower economic strata, soil erosion is a global phenomenon, and in India, the Himalayan watershed, that sustains a huge population and replenishes several perennial river systems, is worst affected by soil erosion. Soil erosion due to water flow, constant high velocity winds and shifting cultivation extensively practised by the tribal population in the North-East has been a major cause of worry.

Dhruva Narayana, the Director of Central Soil and Water Conservation Research and Training Institute (CSWCR & TI), observes, "India is one of the few countries in the world to have estimated the loss of top soil due to erosion. Roughly about 6,000 million tonnes of soil (more than 16.4 tonnes per hectare) is being eroded every year in the country. Along with soil, major plant nutrients (nitrogen, phosphorus and potash) ranging between 5.37 and 8.4 million tonnes are also lost. This loss of crop nutrients even today appears to be greater than the chemical fertilizers being applied to the net sown area in the country".[1]

The Union Ministry of Environment and Forests has recently expressed its concern over the way in which shifting cultivation is taking a toll of forest land in the North-east. A preliminary analysis of the recently concluded ground truth verification survey conducted by the Forest Survey of India (FSI) in Nagaland indicates that the actual forest area in that State is between 50% and 60% and not over 90% as has been earlier estimated by the same agency, A senior FSI official has voiced his concern saying that reduced forest cover is likely to be noticed after the data being collected in similar ground truth verification surveys in Mizoram, Meghalaya, Manipur and Arunachal Pradesh. The official has urged upon the various State Governments to take necessary steps to control this practice.[2]

The rapid rise in population since the begining of the century has resulted in the decline of the man-land ratio. The per capita availability of land has gone down from 1.37 hectares in 1901 to 0.20 hectares of cultivable land in 1981. By the year 2000, when the population is expected to touch the one billion mark, hardly 0.14 hectares of cultivable area will be available per head. The Seventh Plan proposes to spend Rs. 75 crores for setting 25,000 *jhumia* families over 50,000 hectares. In the Sixth Plan, only Rs. 1 crore was set apart for this.[3]

The North Eastern Council (NEC) has been playing a significant role in weaning away the tribal peasants from the practice of shifting cultivation and also in introducing the modern methods in the agricultural system through introduction of packages of improved seeds and regular supply of inputs. A number of seed and nursery farms have already been set up under the auspices of NEC. Over 5000 tribal families have already been provided with settled cultivation through the pilot *jhum* control scheme sponsored by the council. It is now sponsoring 13 Watershed Management Projects in all the units of the region to develop and to put to diverse use the hill land for shifting cultivation.[4]

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[1] Report of an Agricultural correspondent, published in *The Hindu*, May 5, 1987.
[2] *The Statesman*, August 17, 1987.
[3] *The Hindu*, May 5, 1987.
[4] Our Seven Sisters, 1985, NEC-4.

But, despite all the efforts, it seems the results in this direction have not been very encouraging. It has been noted earlier that *jhum* is not only a means of livelihood for the people, but a way of life, and as such a shift from this involves various other changes in other spheres of life. Any scheme in this regard will therefore need people's active participation for its successful implementation. Besides, any resettlement scheme should be undertaken by providing all infrastructure (e.g., transport, capital, markets and schools etc.) and also encouraging retention of tribal way of life. ". . . it has to be remembered that the entire life of the people revolves around *jhum. Jhum* has moulded the character of the people and the society. . . . Any abrupt change from this system will not be wise. It would obliterate the entire basis of a social structure without giving time for the people to take to another in its place. Gradual change over brought in by economic factors such as growth of population, development of industries etc., is inevitable but that will be a slow process during which the society will be able to adjust itself. Any attempt to accelerate the process will mean upsetting of the socio-economic balance ending in a crash which will lead to tragedies and frustrations" (Bhattacharjee, *op. cit.* 36-37).

Conclusion

Shifting cultivation system is not an accidental happening. It has been evolved after ages of experimentation. In the early phase of human culture, as the pressure of population increased, gathering and hunting technology, even when supplemented by selective tending of food plants and domesticated animals, was inadequate for sustenance. Shifting cultivation was the outcome of their endeavour in experimenting new resource utilisation technology. It was satisfactorily suitable for the humid tropical forest where vegetation regenerates very fast. The technology provided an appropriate combination of conditions for the man and was able to support the growing population for a long time.

But, under the changed socio-economic situation, and because of an acute pressure of increased population, the system has proved to be relatively inefficient and inadequate. Various efforts are being made to control *jhum* cultivation, but, the results do not seem to be very encouraging. In fact, it is a challenging task. The basic issue is that of smooth transition from one system to another.

It is felt that some sort of integrated approach is necessary for the control of shifting cultivation. Co-ordination among Agriculture, Animal husbandry, Forestry, Soil conservation, Public works, Irrigation, Cottage industries and Sericulture Departments will probably create a favourable condition to motivate the people against this system. The people must be convinced that they can lead a better life without *jhum*. Alternative avenues should be made available to them to sell their surplus products or labour. On the whole, a long-term policy needs be contemplated for the purpose of controlling *jhum* effectively. Further, while introducing any developmental scheme, caution must be taken to ensure that it does not directly or indirectly, lead to social disorganisation.

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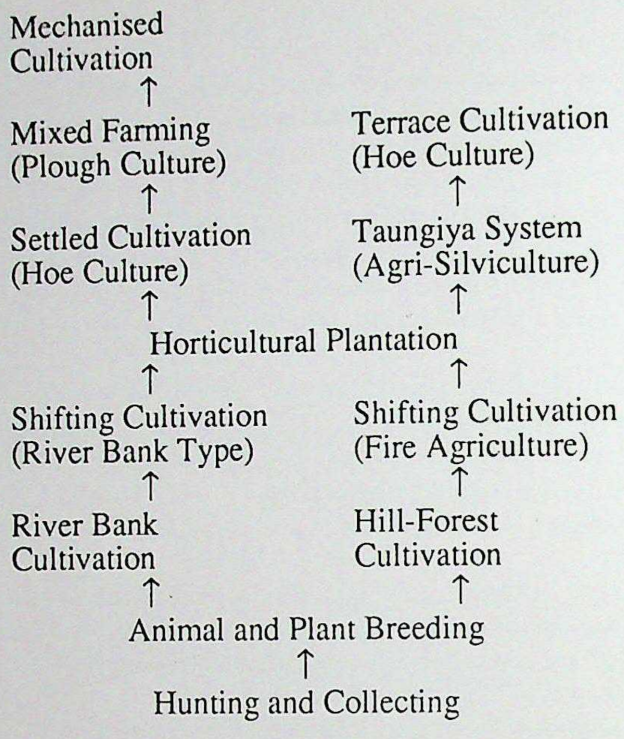
Chart-I

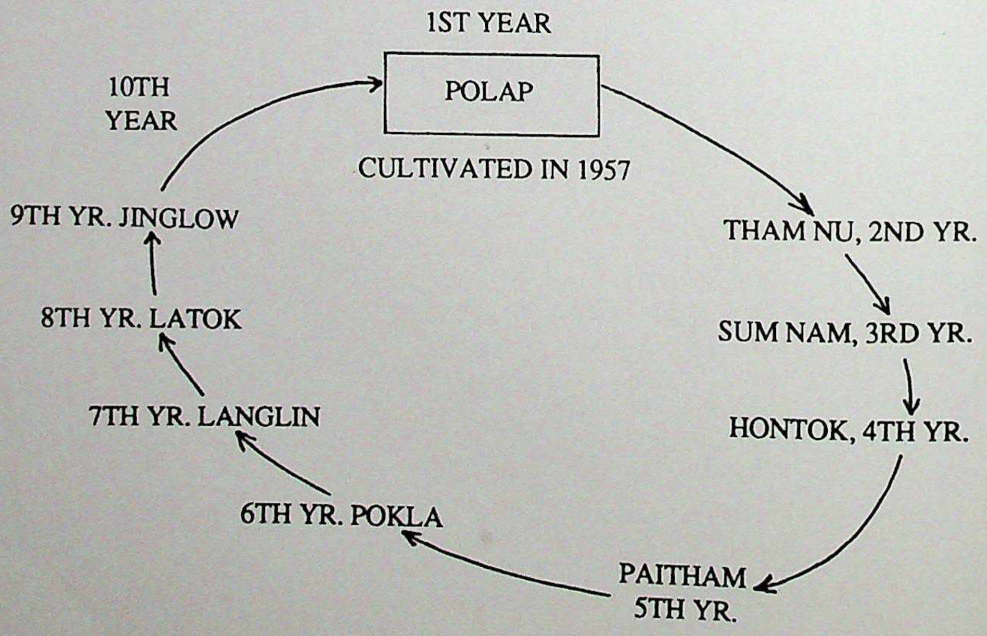
*Evolution of Agricultural systems**


Mechanised Cultivation
Mixed Farming (Plough Culture)
Terrace Cultivation (Hoe Culture)
Settled Cultivation (Hoe Culture)
Taungiya System (Agri-Silviculture)
Horticultural Plantation
Shifting Cultivation (River Bank Type)
Shifting Cultivation (Fire Agriculture)
River Bank Cultivation
Hill-Forest Cultivation
Animal and Plant Breeding
Hunting and Collecting

**Source:* Saha (1978: 112)

Chart-II

Jhum cycle in a Wancho village


1ST YEAR
POLAP
CULTIVATED IN 1957
THAM NU, 2ND YR.
SUM NAM, 3RD YR.
HONTOK, 4TH YR.
PAITHAM 5TH YR.
6TH YR. POKLA
7TH YR. LANGLIN
8TH YR. LATOK
9TH YR. JINGLOW
10TH YEAR

Source: Dutta (1982: 6).

TABLE-1

Estimated Area under Shifting Cultivation, Communities and Population Depending on Shifting Cultivation

(a) 1960-61 and (b) 1974-75

Sl. No.	State	District(s) affected	Tribes practising it	*Estimated area under shifting cultivation for a year (in sq. km.)	*Estimated population partially depended on shifting cultivation (in thousand)
1	2	3	4	5	6
1.	Andhra	(a) Srikakulam Agency tracts, Visakhapathnam, East Godavari and West Godavari	Bagto, Gadabas, Kammora, Khonds, Kotiyas, Koyas, Konda-Reddis, Konda-Dhors, Malis, Manna Dhors, Nayakhs and Rena Savarms	384	200
		(b) East Godavari, Srikakulam and Vizag	Bagata, Jataus, Konda-Dhoras, Konda-Kapus, Konda-Reddis, Mukha Dhara, Samantha and Savaras	173	116
2.	Arunachal Pradesh	(a) Not available		600*	500*
		(b) Kameng, Khit, Siang, Subansiri and Tirap	Adi including the sub-groups of Gallong, Niniyong, Padam, Posi Ashing, Bagni, Bagum, Simong and Tangam Aka, Dafla or Nissi, Hill Miri, Khowa, Mishmi, Miji, Nocte, Tangsa and Wancho	920	797
3.	Assam, Meghalaya, Nagaland, Mizoram	(a) Garo Hills, United Mikir and North Cachar Hills, United Khasi and Jaintia Hills, Naga Hills, Mizo (Lushai) Hills, Kamrup, Nowgong and Cachar	Chakma, Garo, Jaintia, Khasi, Laushai, Lalung, Mikir, Mizo and Naga	2035	977
	Assam	(b) Karbi Anglong and N.C. Hills	Dimasa (Kachari) Garo, Kachari, Karbi or Mikir, Khasi, Kuki, Lalung and Naga	690	331

Sl. No.	State	District(s) affected	Tribes practising it	*Estimated area under shifting cultivation for a year (in sq. km.)	*Estimated population partially depended on shifting cultivation (in thousand)
1	2	3	4	5	6
	Meghalaya	(b) West Garo Hills, East Garo Hills, East Khasi Hills, Jaintia Hills and West Khasi Hills	Garo, Hmar, Jaintia Khasi and Mikir	760	344
	Nagaland	(b) Khoma, Phek, Mokekchung, Mon, Tuesang. Wokha and Zunhebote	Naga, Kuki and Mikir	730	396
	Mizoram	(b) Aizwal, Chhimutuipul and Lunglei Dists.	Chakma, Hmar, Lakhor Mizo Pawi and Riang	650	295
4.	Bihar	(a) Singbhum Santal Parganas, Ranchi	Birjaa, Kharis, Norwas, Mal Paharia and Sauria Paharia	436	115
		(b Santal Parganas	Mal Paharia and Sauria Paharia	162	61
5.	Karnataka	(a) Interior Mountainous tracts of Belgaum and South Kanara District	Bettakurba, Jenukurubam, Kumbis Kuman Marat and Soligars	10	14
		(b) Not available			
6.	Kerala	(a) Attappady, Amosn, Valluvanad Taluk and Malabar District	Irular, Kurumbas, Kurichains, Mudugar and Paniyan	40	10
		(b) Palghat	Kurumbas and Mudugar	19	16
7.	Gujarat, Maharashtra	(a) Dang Dist. and in some parts of Surat District	Bhil, Kumbi, Kakanis, Mavchi Varhli	298	25
		Kelaba Dist. South Chanda Division, Janjira sub-division	Halkki, Kethari Kumari, Maratha, Maria Gond, Thakur, and Wakhals		
		(b) Not available			
8.	Madhya Pradesh	(a) Durg, Bastar, Chhindwara, Chanda, Balaghat, Nandia and Raigarh	Agariya, Baiga Bharia, Gond, Korva, Kodaku, Madia, Majhwar and Mawasi	90	30
		(b) Bastar	Hill Maria	81	15

Sl. No.	State		District(s) affected	Tribes practising it	*Estimated area under shifting cultivation for a year (in sq. km.)	*Estimated population partially depended on shifting cultivation (in thousand)
1	2		3	4	5	6
9.	Manipur	(a)	Hill areas	Angami, Kabui Kacha-Naga, Mariang and Tangkhul	216	183
		(b)	East Dist., North Dist., South Dist., Tangnopal and West District	Anal, Chothe Hmar, Kabui, Kacha Naga Lamgang, Mao Maring Patte, Simte, Tangkhul, Thadou, Valphui and Zou	600	293
10.	Orissa	(a)	Keonjhar, Sundergarh, Denkanal, Sambalpur, Kalahandi, Ganjam and Koraput	Bhuiya or Bhuyan, Bhunkia, Gadaba, Jatapu, Juang, Konga, Koya Khanda, Kotia Poroja and Saora	1600	937
		(b)	Baudh-Khondmals Dhenkanel, Ganjam Keonjhar, Kharagpur and Sundergarh	Shuiya, Bondo, Proaja, Bidayi, Kaluhanoi and Sambalpur	2298	706
11.	Tamil Nadu	(a)	Coimbatore Dist., Nilgiris District	Kadar, Kurumbas Malasar, Pulayans, Paniyans	12	22
		(b)	Not available			
12.	Tripura	(a)	Sadar, Khowai, Kailashahar Kamalpur, Dharma Nagar, Udaipur, Sonemura, Belonia and Amarpur Sub-division	Chakma, Garo, Halam, Jamatia, Kuki, Lushai Mag, Naatia, Beang and Tripura	467	196
		(b)	North Dist., South Dist., and West District	Chakma, Halam, Jamatia, Lushai Mag, Naotia, Riang and Tripura	620	246
	Total	(a)			6184	3309
		(b)			13263	3606

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* Figures for Arunachal for 1960-61 interpolated by author for comparison purposes.

Source: 1. Shifting cultivation in North-east India, published by North-east India Council for Social Science Research, 1976.

2. Report on Population Data regarding forestry communities practicing shifting cultivation in India (FAO/UNEPA Project).

TABLE-2

Agricultural routine of the Wanchos of Arunachal Pradesh*

Sl. No. 1	English months 2	Major activities 3
1.	January	Preparation of field and sowing of millet and maize seeds. Planting of arum and tapioca.
2.	February	Preparation of field for Ahu-paddy. Sowing of millet and maize seeds and planting arum and tapioca continue.
3.	March	Sowing of ahu-paddy seeds started. Planting of tapioca continues.
4.	April	Sowing of ahu-paddy seeds continue.
5.	May	No agricultural activity for men. The women take up weeding of paddy and millet.
6.	June	Same as in May.
7.	July	Harvesting of millet, maize and arum started.
8.	August	Harvesting work continues.
9.	September	Harvesting of paddy and tapioca started.
10.	October	Harvesting of paddy and tapioca continues. Preparation of field for millet, arum, tapioca and maize started.
11.	November	Harvesting of tapioca continues.
12.	December	Preparation of field for paddy started.

* *Source:* Dutta (1982: 8)

TABLE-3

Major crops and the connected agricultural activities among the Wanchos of Arunachal Pradesh*

Sl. No. 1	Name of crops 2	Preparation of field 3	Seed sowing 4	Harvesting 5
1.	Paddy	December to February	March to April	September to October
2.	Millet	October to mid-January	Mid-January to mid-February	Middle of July to end of August
3.	Arum	-do-	-do-	-do-
4.	Tapioca	-do-	February and March	September to November
5.	Maize	-do-	Mid-January to February	July/August

* *Source:* Dutta (1982: 9)

ECOLOGY AND TECHNOLOGICAL DEVELOPMENT AMONG THE TRIBES AND PEASANTS OF NORTH-EAST INDIA

D. N. MAJUMDAR

Ecological Bearing of the Patterns of Subsistence

IN North-east India we cannot make a clear-cut distinction between tribes and peasants so far as adoption of modern technology in the sphere of subsistence is concerned. The main difference between the tribes and the peasants of North-east India is in their habitat—the tribes living mainly in the hills and the peasants living in the valley areas. However, a few of the numerous tribes of North-east India like the Boro-kacharis and the Mishings are found in the valley areas. In a sense we can consider the plains dwelling tribes as peasants. Some of the hill tribes have also now come down to the neighbouring valley areas.

Among the tribes and peasants of North-east India ecology is the main factor determining the economy of subsistence. Valley areas are fertile and plain, so plough cultivation can be done in these areas. On the other hand the hilly areas are not plain and fertility of a plot is exhausted after one year's (or, rarely two year's) cultivation. In the valley areas peasants and plains tribes cultivate the land with a primitive plough drawn by cattle. There is practically no irrigation and manuring. In the low lying areas the loamy deposits after the floods which is an annual feature, increases the fertility of the soil to some extent. There is no elaborate system of irrigation. Little water is required, at the time of planting besides that provided by rains, and this is provided by small irrigation channels. Not much water is necessary for the crops harvested in summer and soils not suitable for the winter crop is utilized for the summar crop.

Ecological Bearing of Shifting Cultivation

In the hilly areas where flat land is not available, except in the valleys of small rivulets, shifting cultivation is the only practicable method of cultivation. In North-east India the method of shifting cultivation is known as *jhumming*. The operations involved in this method of cultivation are very simple. A plot, covered by adequate vegetative covering is cleared in the dry months, in October to February, just before the monsoon starts. The cut up vegetative covering is allowed to dry for a month or two. Just before the time when the first monsoon rain are expected, in March, the plot is fixed, and on the ash-covered burnt up soil seeds of various cereals and plants are sown, dibbled or planted. After this the plants are constantly kept free from unwanted weeds. Crops become ready for harvest one after another. Occassionally such a plot may be utilized for a variety of crops for a second (or even a third year also), but after the second (or third) harvest the plot has to be abandoned for a certain number of years, until it grows sufficient vegetation to be cut down and burnt.

According to Mr. P. S. Ingty, an experienced forestry expert of North-east India, unscientific use of land as for shifting cultivation adversely affects the ecological balance:

> "The ecological balance favouring the complete hydrologic cycle has been seriously up-set over vast areas due to ignorance or lack of appreciation of methods of conserving and managing natural vegetation (whether a forest, grass land or mixed-type) and of clearing the vegetation for cultivation. This mis-use and destruction of plant cover combined with great increases in human and livestock population has created intense competition for natural resources, in many cases residual, as between forestry, grazing and crop protection. In the continued absence of conservation and correctly integrated land use system, overall habitat deterioration has become very wide-spread." (Ingty 1981).

But forestry experts are not unanimous about the evils of shifting cultivation so far as its adverse effects on the ecological balance is concerned. For instance, Chaturvedi and Uppal (1960) state as follows:

> "The correct approach to the problem of shifting cultivation lies in accepting it not as a necessary evil, but recognizing it as a way of life; not condemning it as an evil practice, but regarding it as an agricultural practice evolved as a reflex to the physiographical character of the land. For too long, *jhumming* has been condemned out of hand as a cursed to be ashamed of, a vandalism to be decried. This attitude engenders an inferiority complex and an unhealthy atmosphere for the launching of any development scheme seeking to improve the current practice."

Shifting cultivation is a method of cultivation with minimum technological input. Human energy is utilized to the maximum extent, with a set of most primitive tools. Even in the hilly areas of North-east India shifting cultivation is gradually yielding to permanent cultivation as will be seen from the following figures (Mukherjee 1975):

	Total population dependent on shifting cultivation (in '000)	% of total population in 1971
Arunachal Pradesh	270	57.69
Assam (Karbi Anglong and N.C. Hills)	403	88.50
Manipur	300	27.95
Meghalaya	350	34.58
Mizoram	260	80.74
Nagaland	NA	NA
Tripura	100	06.40

There is neither any scope nor any necessity to introduce advanced technology in shifting cultivation. Whether it is disturbing the ecological balance or not in North-east India it is slowly but steadily dying its natural death.

Settled Cultivation and Advanced Technology

The method of cultivation practised by the peasant communities or North-east India is not much technologically advanced in comparison to that of shifting cultivation. Though the Community Development Programme, since the last four decades have tried to introduce technological improvements in the field of settled agriculture, we can say that there has been little impact of it in the age old pattern of technology. Many social scientists question the desirability of application of advanced technology in agriculture. For instance Hulbe (1978) opines that mechanization of agriculture upsets the delicate balance of the social and economic order in the economy. According to him technology, particularly in the sphere of subsistance is intricately linked with cultural values:

> "Technological change in the broadest sense of the term, is a pre-condition of development. There is no simple description that can adequately include all that is implied in the term technological change. The common acceptance of the term technological change implies movement from rudimentary techniques of production to more sophisticated capital intensive methods of production. The technology of a people, simply expressed is a description of how people do things. It does not explain why people do the things the way they do them or why people are so reluctant to change their way of doing things." (Hulbe 1978)

Unlike shifting cultivation settled agriculture has no direct bearing on the ecological balance. At least we can say this so far as the age old method of settled agriculture in North-east India is concerned.

Industrialization and Ecological Balance

Modern industries involve advanced technology. Most of North-east India has remained industrially backward as will be seen from the following tables:

TABLE-I

Percentage of Population in Industrially Backward Districts

States	% of total population in industrially backward districts
Arunachal Pradesh	100
Assam	76
Manipur	100
Meghalaya	100
Mizoram	100
Nagaland	60
Tripura	100
All India	59

Source: Basic Statistics of North-eastern Region, 1980 published by North-eastern Council.

TABLE-II

Per Capita Power Consumption (1977-78)

State	Domestic	Agriculture	Units of power kw/h Industries
Arunachal Pradesh	5	–	2
Assam	3	–	27
Manipur	4	–	1
Meghalaya	6	–	14
Mizoram	4	–	–
Nagaland	8	–	1
Tripura	5	1	3
All India	11	16	75

Source: North-Eastern Council.

It is not known how long this condition will prevail. Growth of industries with highly sophisticated technology may only mean depletion of already scarce resources and poverty of the masses as stated by Goswami (1985):

> "Setting up of factories or processing units by itself does little to being about economic development of a region unless their forward and backward linkages are well established. Industries which do not induce ancillarization but are engaged merely in processing operations might ultimately prove to be mere parasites eating up the vitals (scarce resources) of the region, severely limiting its future growth potentials. The North-eastern Region's plywood industry and the refineries are pointers to this fact."
>
> "Setting up industries without proper arrangements for proper training of local people might in effect mean a mere plunder of the region's resources ...."

Advanced people unequivocally condemn shifting cultivation for impairing the ecological balance, but the establishment of industries with sophisticated technology is expected to do more harm than what has been done by shifting cultivation since the beginning of human civilization.

New Technology in the Daily Life

We cannot say that either the tribes or the peasants are averse to modern technology. They are all taking advantage of modern science and technology—advanced means of communication, utilization of mass produced machine made goods, utilization of modern mass media like television, radio, video, cinema, etc. Even to the most interior areas buses and trucks are running, some are utilizing still better means of communication like the railways and the air services, TV has become a household word almost everywhere, music cassettes are popular everywhere, video parlours have been set up in many of the urban and semi-urban areas. Some of these will certainly have their impact on the ecology, directly or indirectly. For instance, road construction in North-east India, as pointed out by Ingty (1981) adversely affects the agricultural fields. It also becomes a source of silt load to the natural drainage systems. More and more acceptance of modern science and technology will cause demands for more and more roads, causing more and more damage to the ecological system. Ingty's following remarks are very relevant:

> "It may be mentioned that if a proper study is undertaken we may find an astounding result that the silting up of rivers and streams and spoiling of the fertile cultivation fields through the materials removed through road construction has a considerable contribution which may be as much if not more than those due to shifting cultivation. In shifting cultivation not much or very little of tillage operation is done, there is, therefore, very little soil disturbance, whereas in road construction soil particles are loosened and removed *en masse* which is thrown down the slopes and carried to the streams and rivers and fertile fields during the rains."

At the first sight the benefits of modern technology may be very attractive. But those who are responsible for introducing advanced technology should be very cautious as pointed out by Sapir (1952):

> "Changing people's customs is an even more delicate responsibility than surgery. When a surgeon takes up his instruments he assumes the responsibility for a human life. On his skill and judgement during each moment of an operation depends the future of one individual. If the surgeon is not sware of the possibilities for good and for harm that lie in his manipulation of the scapel, he may work irrepairable damage ....
>
> "The administrator of a programme of technological change carries a heavier responsibility, whenever he seeks to alter a people's way of life, he is dealing not with one individual, but with the well being and happiness of generations of men and women. If his skill is poor and his judgement bad, he may destroy co-operative human relations and create hatred that will affect uncountable number of people."

What Sapir says is about the impact of technology on human relations, but it may also cause a serious disturbance in the relationship between culture and environment which Elwin delineated:

> "For centuries the real ruler of the tribal people here has been Environment; it has shaped their bodies, directed their art, forced babel in their tongues; it has been their Governor, their policy maker; and today when we are challenging its harsh dominion, it remains our greatest enemy."

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ECOLOGY AND THE TRIBES OF NORTH-EASTERN INDIA

SACHIN ROY

THE North-east India on which I like to speak is mainly on the tribes of their region, their ecology and environment to a great extent, is similar.

> "India is a vast country with a rich variety of culture and topography and in this scene of diversity our tribal brethern occupy a very important place. The tribal people have been truly described as an artistic creation of God passionately devoted to their own way of life. They express their joy of life through the colourful forms of their folk-dances and the rhythm of their music".

Their frankness, love of truth and unshakeable loyalty to those who win their confidence are well known. They are literally sons of the soil, and with skill they create neat and clean habitations and meet the other requirements of life.

The beauty of the north-eastern parts of India—the mountains snow capped, undulating series of rolling ridges, clothed with thick vegetal cover, sometimes the nearer hills dressed in pine, oak and fir, the limpid green of winding rivers—all these together, created among the tribals a love for beauty, a sensitive taste and a desire to make good things. They spend their entire lives on a slant, and they have grown very strong, with exceptionally well-developed leg muscles, and the temperament and energy of real mountaineers.

The north-east of India was the homeland of many little known tribes. Their homeland in remote hill-tract, had different access from any direction, unfordable torrents made travelling hazardous and thus the difficulties of communication was responsible for the tribal population who inhabit this inaccessable region to be isolated for such a long period. Isolation initially caused by such ecological factor persisted for long time. Because of the inhospitable physical character of their region, the tribals were able to live within the orbit of their traditional culture.

They are surrounded by different people from the plain villages but they maintain an independent ethnic identity which is likely to be their eco-cultural setting in isolation.

> "In short the ecological setting permit them very limited opportunity of contact with the outside world. The North-east India"………

Which is divided into innumerable small ecological problem areas, in each of which they live in the greatest possible dependence on environment"………

To them "Land is the source of wealth and all other and less permanent possessions are mainly valued as a means acquiring more lands"………

The rule of the great lord of environment has not been all for the bad, and the tribesmen have adapted themselves to it and even modified it. "It has, for example, influenced their architecture, for almost all of them live in pile-dwellings raised well above the ground to avoid the damp." The countless streams and rivers, which become raging torrents in the rains have forced them to devise remarkable cane-bridges which, at their best, are marvels of untutored engineering skill. They would have starved had they not evolved a type of cultivation under, as the saying goes, the inspiration of the gods themselves, which could be practiced on the steep hill sides.

Agriculture is one of the main links between a tribal group and the landscape in which they live and which they exploit. Through agriculture every environment has taught its inhabitants a certain way of life.

> "The teacher of a culture is its environment and agriculture is its class room, the more refined functions of a culture, laws and customs, social and political organization, morals and beliefs are in a sense the superstructure on the foundation of agriculture".

The tribal community are bound to their forest and agricultural land not only by possessiveness but also by reverence as the land is considered as mother who provides them in response to this hard labour, supplies them with hundreds of natural gifts. The land is the foundation of their sense of security. The land to them is a part of their economic security—their main source of subsistence and wealth, their traditional means of barter.

The traditional economy of the tribes in this area is based on the type of agriculture known as shifting or *jhum* cultivation. This archaic form, the predominent type of tillage, is possible in this area as the population is sparce and their density is very low and are surrounded by luxurious forest-growth, sub-tropical climate having heavy rainfall. The practice of jhumming, the only practical method of cultivation on the steep slopes of hills, is closely linked with their economy, social customs, mythology and religion.

> "The shifting cultivation is not a necessary evil but a way of life, it is an agricultural practice evolved as a reflex to the physiographical character of the land."

Some villages have adopted terrace and permanent cultivation, but they too still practice certain amount of jhumming in order to grow vegitable of different varieties.

Hunting and fishing among them is something more than search for food. It has its religious connotations and the success and failure in the ceremonial hunting will depend the success and failure of the harvest. Their villages have been established for security reasons on the tops of hills and widely separated from each other and the water supply was not very easy. The heritage of war has given the tribesmen spears, swords, the ubiquitous and invaluable *dao*, the cross-bow and the ordinary bow, and has made them good marksmen and expert hunters. It has made them adventurous and disciplined.

The dwellings in which the hill-people of this area choose to live vary according to the nature of environment. The range of house styles extended from bamboo huts to the enormous houses with bamboo frame work. Roof tops were palm thached. In some parts because of harsh climate necessitated building in stone, but the number of such houses were insignificant.

Among the tribes of North-east India there were rarely any landlords, no extortionate money-lenders, no liquor-vendors, merchants only in the foot-hills, and there was none of the economic impoverishment, the anxiety and the corruption that such people have brought to other, in more accessible, tribal areas of India. Tribal art and culture, social organisation and traditional institutions were strong and vigorous.

Money values are coming in, but in the interior wealth is still calculated by the number of mithuns a man has, his sacred brass bowls and bells, his store of grain and his ability to entertain.

It is only recently that they have learnt the use of money, they had an elaborate system of barter.

The nature of the country has done much to discourage visitors from the rest of India. All travelling, until recently had to be carried out on foot. Most of the rivers are not navigable because of its high current and innumerable rapids. The foot-tracks in these areas were narrow—usually the shorter routes were selected even if one has to pass over high mountains. But today communication in this part of tribal area has made a spectacular progress.

The policy of development of the tribals has changed greatly as a result the wind of change is blowing through all over the tribal areas of North-eastern India. With the rapid industrialization, urbanization and improved communication in this part of the country under different development plans, social mobility, acculturation etc., in the tribal culture have already set in. Culture change has further been accentuated by economic progress. The rate of such changes is very rapid, and the effects are witnessed in both the tangible and intangible aspects of the culture of the tribals, as well as of rural people. Its profound impact on the tangible or material aspect of tribal culture in this part of the country is worth mentioning. Along with development plans and industrialization, communication has been greatly improved, even in the remotest parts of their country. For exploitation of mineral resources, the tribal areas have been penetrated by a large non-tribal population. New habitations and marketing centres have grown up. At the same time, due to improved communication, the tribals themselves are coming out of their remote homes and are now in constant contact with the non-tribal population. Many of them have already changed their traditional professions and have started working in the industrial complex. To add to the list of conditions due to improved communication, the pedlars have started introducing cheap industrial products of daily use into these areas. The result is obvious: the tribals have started giving up their own indigenous technology and preference is being shown for the use of cheap and easily available industrial products. Many of the tribal people are no longer producing wooden ladles, dishes, bowls and other wooden handicraft objects, widely made by them a few decades back, but they prefer now to cheaper industrial products, like aluminium vessels etc. In some other circumstances, due to reservation of forest lands, the tribals of the area are not in a position to utilize the forest products for preparation of their utilitarian objects and are thereby forced to forego their tradition and to switch over to the industrial products. Many of the tribal people have settled with the non-tribal population, and are employed as industrial labour and, in the changed process, are practising an economy which is contrary to their traditions. In certain situations the tribals are supplied with different raw material and better tools and the original technology is in the process of change. In the development programme the tribals are now given training in different craft centres to produce such articles of arts and crafts as have good demand in the market, even at the sacrifice of their conventional designs. In the planned sphere the tribals today are provided with improved technology, improved tools and modern technological training. As a result, the tribal material culture, particularly the articles of daily use, arts and crafts, are changing rapidly. With these changes the impact on their social and religious organisation is also marked. With growth of industrialization and urbanization the pace of social change among many of the tribals of India has accelerated.

There are people who still preserve to a considerable extent the tribal technology, economy and social organisation. The importance, from every point of view, of these last living remnants of ancient stages of human cultural development is so obvious that it need hardly be stressed.

Over the past hundred years, folk-art all over the world has undergone profound changes, and in many countries had degenerated, or even died out. This slow, inexorable decadence is attributable to many factors, such as the competition from industrial manufactures, changes in ways of life, the emergence of new needs, calling for production from different raw materials, the low output of the craftsman, who cannot meet the needs of a growing population, changes in popular taste and sensibility.

Folk art can be graphic or plastic, and will include paintings, sculpture, wood carvings, architecture, ceramics, textiles and metallurgy. Popular traditions will include music, dance, drama, and folklore. In depicting aspects of folk art, it will be interesting to emphasize how tribal art has often utilitarian motives, like the art for magical purposes. Utilitarian objects, such as tools, utensils, houses are very often the focus of folk art, either in an effort to produce aesthetic satisfactions by objects of daily use, or sometimes, to increase the efficiency of tools and weapons by a belief in their supernatural or magical effects.

Few countries are richer than India in tribal and folk arts and artifacts, and all that goes with the ancient traditional communities which have developed and until very recently, have been protected in some isolation, over long period of time.

The tribals had been mostly in the most difficult part of the country. This denied them the easy-luxury of material comfort and only grudgingly suffered the presence of their humble homesteads and small clearings in the midst of the ever-encroaching jungle. Man and nature remained there for centuries, facing each other, entrenched in their positions, making occasional forays into each other's, dominion. But the struggle was harder for man. It has determined the character of the road to spiritual serenity, across the perplexities and dangers of daily life. Nature, more hostile than friendly, appeared to the tribals to be controlled by a host of spirits who are ill-disposed towards men and lurks in every corner, looking out for chances to do them harm. Their animosity is an omnipresent and constant concern to the tribals, and thus their religion was moulded, in practice, to counteract evils.

Living is a dreary business. It binds man to a chain of routine duties which if they keep the body alive kill the soul. The joy of living vanishes with the serious business of living. Hence human life, however, primitive it may be, is never satisfied with bread alone. It finds relaxation in songs and dances. The pattern of life lived by a society is the creation of the human spirit, in its endeavour to adjust itself to its surroundings. These efforts again produce vibrations in the soul that are translated into expressive rhythms of the body. So the dance has been a natural method of expressing tribal ideas and emotions, and of celebrating communal joys and sorrows, aspirations and fears, love and hatred, achievements and ideals.

Change is one of the few considerable in living culture. No culture continues the same for any considerable period of time. But in the course of a rapid developmental process, and of changes of the economy and of the social organization, new forces started erroding the power of resistance to change of these people. But they refused to sacrifice pride to comfort, and stubbornly refused to surrender any item derived from their own gods. But how long, in the face of gradual infiltration of development plans, can they resist? There are now examples of new religions emerging which have started corresponding changes in festivals, economic life, and way of life in general.

The conservatism is gradually giving way and their strong attachment to their own beliefs are receiving continuous shocks. Changes in the economic sphere are bringing the tribals close to the rest of India and their minds are already ripe for acceptance of new ideas, responding to the opportunity of acculturation thus provided.

I am projecting this picture not to discuss whether the effects of development are good or bad, but to draw the attention of my colleagues to the change that has set in, resulting in the disappearance at the traditional technologies.

I would now request my ethnographer friends working in the Anthropological museums to focus their attention to a few of my suggestions.

There have been study and research on the social organisation while complete disregard has been shown to the study and collection of their material culture, their arts and crafts. This is the more regrettable, since it is precisely the traditional arts and crafts which are disappearing fast, under the impact of modern technology and import trade, and this is true not only among so called tribals but also among all the folk people who practice traditional ways of life, and had traditional arts and crafts.

For museum ethnographers it is all the more necessary to study such changed cultural phenomena, in order to document the ethnographic objects already collected, and the changes emerging so rapidly. But a pitfall should not be ignored at this stage, i.e. such observed changed cultural phenomena should not be confused with their traditional cultures. Such distortions must be continuously avoided. While we are all concerned about the necessity of the salvaging the cultural remnants, we should not over zealously salvage anything available, without its proper study, in relation to the life of the people concerned.

The only way to preserve and promote the varied folk and tribal arts which are so closely connected with the complex culture and social life of the people is to salvage those examples which are potent and faithful reflections of these people and their artistic feeling. This will cover popular or traditional art and handicrafts, whether folk of tribal.

Thus, before the period of mad imitation overpowers them fully, and complete disintegration taken its course, ethnographers should start effective methods to collect which constitute an integral part of culture.

Their dances and songs, are facing transformations and slow and premature death. This trend is so strong that the time is not very distant when we shall be left with no trace of traditional songs and dances. Their disappearance without trace, or with inadequate recording is a loss, not only for India, but for the world.

It would be a disgrace for our science, should we allow all trace of these people to disappear in modern times, by neglecting to collect their artifacts, as long as it is still feasible.*

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*Two eminent Anthropologists, Late Dr. Verrier Elwin and Dr. C. Von Fürer Haimendrof initiated me in the tribal areas of North-East India and I have time to time quoted their views. I have also quoted extensively from my paper "Identify those aspects of traditional, rural and tribal cultures which have been seriously affected by industrialization, urbanization and other contemporary factors", read at Sri Lanka on the Centenary of Colombo Museum with the participation of UNESCO and ICOM.

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TECHNOLOGY AND SOCIAL NETWORK: A CASE-STUDY OF SOME CHANGING TRIBALS OF CHOTANAGPUR

K. N. SAHAY

I

THIS paper deals with an important area of study which is so far neglected and virtually unexplored. One hardly finds specific studies dealing with this subject-matter and tribal studies by and large make just casual reference to technological change among the tribals.

The word 'technology' has probably come to mean different things to different people (Roy, 1985 : 11). Besides, some people talk in terms of *basic technology* meaning man's control over natural phenomena and *social technology* meaning techniques devoted to the regulation of behaviour of human beings. Similarly, terms like *Economic technology* and *Political technology* are also in use (Mac Iver & Page, 1953 : 498).

In the present context, the term 'technology' will mean "Tools and techniques for the extraction, conversion, and utilization of resources; *i.e.,* the methods of extracting resources from the *habitat* and of producing and distributing goods and services ...." (Vivelo, 1978 : 261).

Broadly speaking, technology refers to the various ways and means for harmonizing energy and circulating it throughout a social system. In this sense, technology is inseperable from a society's *organization of labour i.e.,* the way people organize themselves for purposes of work (*Ibid.,* p. 261). It is the effective use of productive ends of the energy potential in the habitat that provides for man's survival and maintenance and which constitutes his *adaptive strategy* in a given environment (*Ibid.,* p. 28).

Thus, the technology of a group and the organization of labour that it leads to, play a significant role in determining forms of social organization (*Ibid.,* p.28). A change in technology leads to a change in social network of the group. "Every change in the process of production, every new attempt to utilize means either for private or for public gains, involves a new alignment of the human beings engaged in it ...." (Mac Iver & Page, 1953 : 516). Sometimes this social effect may be a *direct* result of change in technology while at other, it may be an *indirect* process.

II

The tribal population of Bihar is mainly concentrated in the southern part of Bihar known as Chotanagpur which for the most part is a hilly and forested region and an administrative division covering the districts of Ranchi, Lohardaga, Gumla, Hazaribagh, Palamau, Singhbhum, Dhanbad and Giridih. According to 1971 census, the total tribal population of the State is 4,932, 767 and total number of scheduled tribes is 31.

In ancient time, the whole of Chotanagpur was covered with deep forest. In course of time it witnessed the immigration of Mundari-speaking tribals who cleared the virgin forest and became the original settlers of the villages. They were known as *Khuntkattidars*. In due course they were followed by Dravidian-speaking Oraon who came from Deccan area in the south after migrating through and staying at several places. "During the course of thousands of years, these tribals went on multiplying with the result that now we have as many as 31 scheduled tribes (Roy, 1915 : 31; Vidyarthi & Sahay, 1976 : 30-31).

Most of the tribes of Chotanagpur are plain agriculturists among which mention may be made of the Oraon, the Munda, the Ho, the Kharia (Dudh Kharia), the Kherwar, the Chero, the Gond and the like. Even though these tribals are agriculturists, they generally go for hunting and fishing in the slack agricultural seasons.

The tribes like the Birhor, the Korwa and the Kora are essentially in the stage of hunting and food collection. Besides, being hunters, the Birhor are also nomadic and wanderer from forest to forest in quest of games and raw materials for ropes.

The tribes like the Maler, Hill Kharia, Asur (partly), Korwa, Parhaiya, Birjia, Binjhia, Gond, Pahariya and others have been basically hill cultivators and practising slash and burn type of cultivation, though most of these except the Maler have almost given up this practice and taken to plough cultivation or basketery.

The tribes like the Lohra, Karmali, Chick-Baraik and the Asur are minor and artisan tribes who mostly depend on the works done for the major tribes of the area concerned (Sahay, 1980 : 25-27).

By and large, these tribals are animistic and tradition-bound among whom the belief in supernatural powers plays an important role in their life in general and economic life in particular. As such, they have a number of supernatural beliefs and rituals, ceremonies or festivals associated with different agricultural or other economic operations.

Traditionally, a tribe is a self-dependent unit. A tribal village also is self-contained having its own religious, secular heads and a village council though occasionally it interacts with other villages within a cluster for settling inter-village disputes, breach of tribal laws, marketing, or other purposes. But their social network is, by and large, confined within the tribal group.

III

The tribals of Chotanagpur have been exposed to the working of several agencies of change during the course of history of which contact with Hindus has been the oldest, most prolonged and effective. It worked through several channels like the Hindu Rajas and their men, Hindu landlords who ruled over these tribals, different Hindu castes which the Raja called from outside and settled in Chotanagpur, contractors, petty businessmen, money-lenders and the like. The influence of the Hindus, by and large, worked in a manner different from other agencies in the sense that the tribals have been living along with Hindu neighbours for centuries. Under the circumstances, the tribals themselves in course of their contact with Hindus felt inclined to emulate the Hindu model of life and gradually borrowed a number of traits of the Hindu society and culture on selective basis. It stands in contrast to other agencies of change like Christianity which is working since the middle of last century; industrialization and urbanization which had their advent towards the fourth quarter of eighteenth century with the opening and exploitation of coal, mica, iron-ore, bauxite and several other mines; and welfare agencies, developmental programmes, democratic experiments, educational programmes which all came into being or some of which got accelerated with the independence of the country. The changes brought about by these agencies were all planned, induced, sponsored and relatively fast.

IV

The tribal life in Chotanagpur has witnessed various socio-cultural transformations owing to the factors mentioned above, but indigenous technology is an area where *by and large* the tribals still show some sort of resistence and are reluctant to part with it as they are pre-literate, magico-religiously oriented and tradition-bound, or find the new technology to be inconvenient. Whatever, little change that have been effected in their technology can be mainly attributed to the agencies which are planned, induced and sponsord as mentioned above.

In about last four, five decades, Chotanagpur, mainly the industrial centres have witnessed large scale immigrations, population explosion and ruthless cutting of forests. The last factor has led to ecological in balance and new forest legislations denying or restricting the access of tribals to these forests were made by the Government. Those few tribal communities who were mainly dependent on forest for their economy have found themselves in a quandry, their economy being badly affected by it. It has also to some extent, resulted in the change of their technology.

It is significant to note here that change in technology among the tribals in the present context has two different implications. Firstly, it refers to the improvements in the already existing indigenous technology or replacement of an indigenous technology with a new one which serves better the traditional needs of the people. Secondly, under the changed context the tribals have created entirely new sets of needs and have adopted entirely new technologies to fulfil these needs. The present paper will give its main focus on the first type of technological change while taking into consideration its social context as delineated.

This study would be mainly confined to the changes in technology that have taken place among the tribals with specific reference to the Christian Missionaries and *Adimjati Seva Mandal*—a non-Governmental organization, as they operate in Chainpur area of Gumla and Kharsidag of Ranchi respectively. Chainpur is an important Christian belt inhabiting Oraon converts of Roman Catholic and Lutheran denominations. Kharsidag comes under Khirji Block of Ranchi (nearly 15 kms. from Ranchi) where the *Adimjati Seva Mandal* is running a Development Project in a cluster of twenty-four villages sponsoring 603 families among which nearly 80% are tribals mainly belonging to the communities like Munda, Oraon and Lohra. This project originally started with 10 families in 1975 and extended to 24 families in 1978. Besides, references of tribals from some other areas have also been made to present a general picture of technological change taking place among them.

V

One of the most significant impact of Christianity on tribal converts was that it could make the people educated and tried its level best to see that they shun superstition and develop a rational outlook. Though it is a long drawn process and not that easy as it looks, comparatively speaking tribal converts in general are now definitely more modern, adaptive and receptive to innovations than their non-christian counterparts. This, combined with overall, constant and effective leadership which Christian Missionaries offered to their converts on all the fronts of life, made them optimistic during the process of change and taken to improved or new technology more confidently. On this count, the people are also backed by an effective system which the Missionaries developed for an all round development of their people.

With conversion, the entire set-up of a tribal village has been transformed and now it has much wider social extensions than a non-christian village. This network works on the regional, state, national and even global levels. The place of *Pahan* (religious head) has been taken up by the catechist appointed by local church. The system of *Panch* (counsellors) can still be found in every christian village. The catechist and the *Panch*—who are usually five in number, run the whole administration of a christian village. They are considered to be official leaders of the village in religious, social, economic, political or other matters and they do it under the supervision and guidance of the *Parish* church. Almost all christian villages have their own church (*Girja*) made of mud-walls. Such a christian village with its church constitutes a congregation, the smallest administrative unit of a Catholic Mission looked after by a catechist. Several such villages make a *Parish* headed by a *Parish-priest*. When several *Parishes* join together, they make a *Bhikhariate* under the charge of a priest known as *Dean* or *Superior*. A *Diocese* is a combination of several *Bhikhariates* controlled by a Bishop. Several *Dioceses* make an *Arch-Diocese* controlled by an Arch-Bishop. On the national levels a *Cardinal* exercises control over several *Arch-Dioceses.* A country may have more than one *Cardinals.* On international level, the highest religious and administrative authority of the Roman Catholic Mission vests in the *Pope* who resides at the Vatican city in Rome. His pronouncements on religious and other matters are considered to be infallible. The Lutheran converts of G.E.L. Church have also a similar administrative organization though varying slightly in names but their network is confined to zonal level. It is because the Lutherans who were originally affiliated with Germany became autonomous in 1919 and since then managing their own affairs. The highest religious and testelory head of the Lutherans is known as *Pramukh Adhyaksh* or President of the 'Gossner Evangelical Lutheran Church in Chotanagpur and Assam' the jurisdiction of which also includes some portions of Madhya Pradesh. Besides religious and administrative networks of the two denominations of converts as said above, they have many other types of regional, state, zonal, national and global forums and affiliations which make their social network all the more complex. A change in social network invariably leads to change in its cultural context. There is useful dissimination of ideas, incentives, inspirations, resources and interactions with different types of people that lead to an all round development of the tribal converts. The converts have also regular magazines and other literature published by their church which casually disseminates informations relevant to technological developments in their midst.

The Christian Missionaries concentrated on the improvement of agricultural system of the converts which is the main source of their livelihood. With this end in view, agricultural lectures were arranged among them with the cooperation of Agricultural Department of the Government and people were asked to use improved variety of seeds and chemical manures in their fields. They were told where and how to procure it. They were also asked to use improved methods of cultivation including the Japanese method. Some educated and enlightened Christian converts were the first to use these technological innovations in different villages and served as 'radiators' of technological innovations.

Through annual general meetings of the *Catholic Maha Sabha,* or similar other bodies, experienced and educated christian villagers as well as Missionary priests and churchmen are required to address the tribal converts of topics concerning improved and scientific methods of agriculture through which the people could increase their yield and raise their economic standard. They are also told of the new agricultural implements being developed by Birsa Agriculture University and similar organizations, pesticides, artificial insemination facilities available at the Block level, financial help they can receive from rural banks and missionary sources, piggery, poultry, cattle diseases and proper treatment and the like (Sahay, 1976 : 425-26).

Father Hoffman is considered to be the founder of 'Chotanagpur Catholic Mission Cooperation Credit Society' with its rural units or circles throughout Chotanagpur. In recent decades this society also played a vital role in technological development among the Catholic christians. Under its extension programme the cooperative society introduced joint-farming and connected technological innovations at few selected places like Bendora, Asro and Punri under Tongo Extension Centre and in Dhumbarpath. In each such village certain number of converts contributed their patches of land at one particular spot. Each such society has got its own Managing Committee, consisting of the important members of the society, which obtains loans from the circle's cooperative Bank of the Parish for the purchase of improved variety of seeds, chemical manures, improved implements and other technical equipments etc. There are trained agricultural advisors at tongo and other centres who educate the tribal peasants in improved techniques of agriculture by trying them out on their own fields and help them in the planning of the crops, figure their needs in chemical manures, pesticides and credit, organize the supply of these from different sources and the nearby small town, provide spraying and dusting facilities, supervise the actual cultivation and teach them rudimentary cost accountancy. The society has also tried to introduce new crops like sugarcane and china-nut and introduced among the people the technology of making jaggery. The cooperative society owns a tractor equipped with accessories and this is placed at the disposal of the people of Tongo centre. It is used off and on generally for lifting water from local ponds and rivers for irrigating fields and such other purposes.

In about the year 1966 the Lutherans launched a scheme known as 'Agricultural Service and Marketing Association' which initially covered Lutheran villages of the Ranchi district. Besides arranging technical advice by agricultural experts to the peasants and helping them by providing loans and procuring good variety of seeds and manures and improved agricultural implements, the Association also looks into suitable means for proper marketing facilities to relieve the producers from additional worries and boost the volume of production *(Ibid.,* pp. 419-20).

Occasionally, some of the magazines published by the Mission or church like *Nishkalanka* and *Gharbandhu* which have very wider circulation among the Christian converts publish features on improved technology connected with agriculture and horticulture like mixed-manure, green-manure, presticide, cultivation of crops and vegetables and the like to the advantage of the tribals.

Christian Missionaries opened a number of vocational centres at various mission and church stations imparting training in carpentry. The tribals in general in the traditional context already knew a little bit of carpentry the knowledge of which they used for making *Pidha, Khat,* wooden rafters, doors etc. with whatever impoverished tools they could get through Lohras or indigenous technology which they had at their command. With the opening of such vocational centres the tribals inclined towards this profession got thorough training in using all sorts of tools connected with carpentry which were procured from urban areas and were considerably refined, and techniques that are required for making a professional carpenter.

With the advent of modernization the Lohras who traditionally used to make locks, tools to be used in carpentry, knifes and other cutting-implements, plough-share and the like, had to face tough competition from modern markets where most of these items were available in their refined form. On the other hand, the Lohras acquired new tools and techniques at the initiative of Missionaries to make symmetrical size of stone-slabs from rocks available in local hills that are used in the making of stone linings in a well or stone walls in a house. Stone lining in wells or store walls in a house itself involved a change in technology which may be found in a number of Christian as well as some other tribal villages.

The tribals had old type of storage system for paddy. They used *chhatka, mora* and other big size of baskets. But it was always vulnerable to rats. Now in a number of christian villages the people have improved their technology of storage specially when they are required to store huge quantity of paddy under the auspices of Paddy-Magazine. Paddy-Magazines are collectively built of stone-slabs by the villagers. Its walls as well as floor both are built of stone-slabs, cemented and a door fixed in such a manner that saves the distruction of grains by rats or other insects.

Chotanagpur is a hilly area with its land full of underground rocks. It posses a problem to those who want to dig a well. Sometimes money and labour both go waste if one discovers rocks after digging a few feet or one does not find a water stream on the spot. When the Belgian Missionaries came to Chotanagpur they also felt concerned about it and used their own technology to detect an underground rock and the water stream on the spot so that one could know it before hand and select a site accordingly. The present author had the opportunity to observe this technology at work and try it himself particularly the second one which locates the underground stream. It is done with the help of either two steel rods or thin green bamboo-sticks nearly three feet in length. One walks on the site with the two rods or sticks in hand in a particular position and gets the indication where there is an underground stream. The Christian tribals frequently use this technology while constructing a well.

VI

Though there were impressive achievements in communication, extension of education and medical facilities under Community Development Programmes, development in the field of agriculture was not impressive. While talking about the Munda area Sachchidananda (1979 : 331) says that no doubt, some Mundas began to use improved seeds, chemical fertilizers and also better techniques of agriculture but as most of the Munda areas are one crop area, the process of self-generating and self-sustaining growth could not be set in motion. "On account of poor resources most tribal families could not be involved in agricultural development".

In a case-study of village Kamre, a predominently tribal village located hardly 8 kilometers from the industrial city of Ranchi and well exposed to the sources of modern influence, the villagers are reluctant to use the modern chemical fertilizers because firstly its use needs larger amount of water supply not available in the village; secondly, the villagers say that if they do not use chemical fertilizers constantly for every crop, the fertility of the land will go down; thirdly, as the chemical fertilizers are new to them and they have to clear-cut idea about their use, they do not want to take risk by using them in their agricultural fields; and fourthly, the

Block workers are not so much active in this regard. Further, it was found that the villagers continue to popularise the use of the same implements for cultivation which their forefathers had used. "They have neither adopted any new technique of cultivation of crops nor have they improved their traditional types of implements" (Vidyarthi, 1971 : 31-32).

The tribals are entitled to get loans from Rural Banks, for the purchase of agricultural implements, animals, seeds etc. But generally it was complained that the procedure of taking loan was cumbersome and usually it involved untold harrasment on the part of the tribals. Some tribal villagers have been given improved variety of he-goat for improving the pedigree of goats but the he-goats are either old or weak enough to serve the purpose.

In general, tribals have started using nylone threads for making fishing-nets which is stronger, more durable and can be obtained from small towns or some village-markets. For the same reason, in many tribal areas people have switched over to nylone-ropes for making *Sikka Bahinga* used for carrying manures, grains, seedlings and the like.

Tribals have been traditionally using *paila* (wooden measure) for exchange of grains. Vegetables were sold in heaps of different quantities prized differently. But now due to contact with non-tribals and rapid urbanization many if not all tribals, particularly in urban areas have partly or wholly taken to weighing balance (*Taraju*). Secondly, in many areas where balance was in use, there used to be an indigenous type of balance with only one weighing plate in it. But this indigenous weighing technology has almost declined. Again, not all the tribals who used weighing balance used all standard metallic weights. Stone pieces equivalent to metallic weights were most commonly used. But now stone weights are being gradually replaced by standard metallic weights.

Tribals had an indigenous technology of producing fire by rubbing two dry wooden pieces of specific plants with a piece of cotton fixed at the rubbing point but easy availability of match-boxes has led to the disappearance of this fire-making technology, specially among the younger generations of tribals.

The Asura, Birjia and Lohra were traditional iron-smelters and black smiths and knew the indigenous technology of iron-smelting. They would collect *Bichchia pathal* (hametite) from local hills, make a huge size of earthen pot in which this mineral was placed and then it was put on fire. It was an elaborate process connected with several beliefs, taboos and rituals. But now partly because of opening of Tata Steel and other factories in this area and easy availability of raw iron in village-markets and small towns, and partly because of restriction on cutting of wood in reserve forests, this primitive technology has been badly affected and now it is completely out of practice. The last evidence of iron-smelting among the Asur and Birjia was found nearly 6 and 12 years ago in the Netarhat area in village Ramjharia and Naina respectively.

Tanginath which is an ancient site of religious importance located in Dumri Block of Gumla district contains hundreds of ancient images of Hindu Gods and deities, and temple remains besides a huge iron trident of nearly fourteen feet height from the surface. The most baffling feature of this trident is that it is rustless. Local iron-smiths are believed to have built it. But now this primitive technology has been completely forgotten.

The Lohra traditionally used two types of *Bhanthi* or air-blower *i.e.* the first having two wooden round blowing posts, one side of which was covered with lose leather and a women would stand on these two pot—like apparatus and press each of them with her leg one after the other so that air would blow out of the pipe fixed in between these two posts; the second having only one bigger size of blowing pot with an attached thread on one side suspended through the ceiling which when pulled, air would blow out of it. Though the second type of *Bhanthi* still continues in many areas, the former which appears to be older, has virtually disappeared. Still a third type of technology has been introduced in many cases, specially of those Lohras who have to move to different places. It is bazar-made, metallic air-blower available in small towns and cities which has a wheel inside and a handle, smaller in size and easily transportable.

Being a rocky place, as said, it is difficult to dig a well in many parts of Chotanagpur. But if one comes across a rock in this process traditionally the masions had hard time breaking such rocks. But now in many parts of tribal area one finds frequent use of explosives in blasting the rocks which made the job much easier. It is specially used by professionals and contractors who know where to get the explosives and help the people in this respect.

The tribals used their own technological devise for pressing oil out of *Jatangi, Dori* seeds or the like and used two wooden logs to press it. The seeds were first steamed and filled in small packets made of bamboo splinters, then pressed. The oldest technique was either to put heavy stone blocks upon the upper log or wrap it with a rope and apply maximum pressure to extract oil. But in the last four, five decades this technique is gradually changing in Munda and Oraon area and now it is made in the likeness of a bull-operated pressing apparatus. But instead of bullock it is the man himself who works.

During feudal days tribals would work in the house of landlords and other key-persons of the village. Some of them would go for hunting with their masters and would use old style of gun whose nozzle had to be filled with gun-powder, known as *Thansua*. Some of these tribals became expert hunters and masksmen and still a number of them in Palamau, Latehar and Gumla areas from the tribes like Chero, Kherwa, Oraon and others may be seen in possession of such illegal guns made of pipe who very often hunt wild games specially pigs. For these tribals who traditionally used bow and arrow, spears and *Balua* etc. their hunting technology has been modified. They keep close contact with people who make regular supply of gun-powder to them whenever needed.

Another type of hunting technology that was introduced with the advent of explosives in this area was its use in the ditch-technique of hunting pigs. In the Netarhat and its neighbouring area the tribals like Asur, Korwa, Birjia, Kherwar, Munda and Oraon dig out a long ditch of nearly ten feet in length and three feet in breadth and depth. This ditch is dug out on way to paddy field during the season of crops on the side from which pigs usually come to the paddy field and destroy the crop. The upper surface of the ditch is covered with leaves and twigs. At the entry point a big stone is suspended which on the slightest touch falls down and hits the explosive placed just beneath it over another slab of rock. As soon the animal appears on the scene, people who remain in hiding, make noise and try to direct the animals towards the entrance point. The animal who passes through that point touches the stone and there is a loud explosion which injures the animal and a number of others who follow. They fell down in the ditch and get trapped.

The Oraons of Bero, Bharno and Mandar areas have devised a new technology used in irrigation. They use wheels of Rikshaw as a pully in drawing water from well which is easily dug out in these areas on account of its lower water level. Two buckets are suspended at the two ends of the rope which pulls the buckets filled with water alternatively operated by two men who work on it. This has inspired the tribals of this area to grow vegetables on large scale for commercial purpose. We are told that the tribals are taking full advantage of it and have developed organizations through which they send their vegetables in trucks to distant places.

Several tribes like the Birhor, Korwa, Maler, Asur, Birjia etc. have been dependent on forest for their sustenance. But there has been a great deal of destruction of forests and Chotanagpur has lost 18% of its forests in recent years (Sachchidananda, 1976 : 331). This change in ecology combined with the Government's anxiety to preserve the forest through legislation have affected these tribes adversely. The Birhor, specially in Hazaribagh as well as some of them in Ranchi district find the forest less productive and useful which compelled them to settle at a place for longer period. Due to it the Government also came to their rescue and tried to settle them by giving agricultural land, cattle, house and other facilities at the places like Budhachanch, Tulbul in the Vishungarh Block near Bagodar in Hazaribagh district in about the year 1978. It implied a change over in their hunting and gathering based technology to agricultural based technology. But it was informed that the Government abandoned this project after a period and now by and large, the Birhors have relapsed to their old style of life.

A similar experiment was made much earlier in around the year 1957 among the Birhors of Bishnupur area who were re-settled at Jahangutua and Beti resettlement colonies. After a great deal of efforts on the part of the Government and trial and error, finally some Birhor families have been permanently settled in these colonies taking to technologies connected with agriculture.

It is reported (Sandhwar, 1978 : 18, 115) that one section of the Korwas of Palamau who were traditional shifting cultivators, were forced to stop it at the behest of the Government, come down from hilly forests and take to the profession of settled agriculture and basketery depending on different ecological surroundings available in their respective areas. It was followed by a change over from one type of technology connected with forest-economy to other types of technology connected with settled agriculture on the plains and basket-making. It has further led to significant charge in this social contacts.

VII

A number of welfare schemes have been launched by the Adimjati Seva Mandal in the twenty-four villages of Kharsidag area which have brought about significant technological change. The changes have mostly taken place among those tribal farmers who are 'progressive' *i.e.* who could develop the concept of trade and commerce or have become aware of its benefits and are eager to improve their lot by changing their technology. There are nearly sixty progressive tribal farmers in the area. However, it was told that these tribal farmers have a tendency to relapse to their traditional system of technology in case they feel any sort of difficulty or harrasment in procuring requisite items connected with their new technology.

The tribals usually had only one *Kharif* crop and they used to grow paddy sown during April and May, but now the people have started doing also *Rabi* crop like wheat, potato, mustered, gram and the like. For this purpose about 15 families have started fencing their fields with barbed wire to prevent animals to enter their cultivable fields. This innovation was introduced after 1980 and for that they have to contact the hardware shops at Ranchi.

The traditional style of irrigation was through *Kuri,* a large size of bucket which was used in a well to pull the water or through natural water source in some areas. Nearly 20 Dizel pumps were introduced in 6 tribal villages for irrigational purpose in the years 1982-84. The Seva Mandal helped the tribals to obtain the requisite amount of loan from Rural Bank which had to be repaid in convenient annual instalments, the Mandal itself contributing 40% towards the repayment as 'seed money'. In case, if some tribals had difficulty in repayment of loans on time, again the Seva Mandal came forward to help the people by paying on their behalf from Interest Free Revolving Fund which the tribals had to repay at their earliest opportunity.

There were nearly seven progressive tribal farmers who in the years 1980-84 procured Tractor from different sources on payment basis for ploughing their fields. They have to pay around Rs. 25/- per hour for this service. In one hour the Tractor ploughs nearly one acre of land. The Tractors were obtained from the Agricultural College, Kanke, a Bengali from the village Pindarkum, a contractor associated with *Awaz ahar* at Ranchi and a non-tribal of Tupudana. Some of these people also contact the tribals in this connection.

A tribal village usually has one or more *Danri* or natural spring which was used as a water source for drinking purpose or for washing their cattle. The Mandal has inspired and helped the people to construct several smaller dams made of stone slabs fixed in cement which could be used for irrigation. It was entirely a technological innovation for the tribals.

Besides, the idea of water Reservoir was also introduced and the Mandal helped to build six such water Reservoirs made of cemented bricks of a size which stored nearly thirty thousand litres of water and once it was full, it irrigated about five decimals of field in about twenty-five minutes of time. Usually diesel pumps were used for this purpose except one.

The most important technology that has been introduced is a Solar pump at village Sarval. It was introduced in the year 1982 at the behest of Xavier's Institute of Social work under some scheme of the French Government. It has benefited fifty tribal families of the village in irrigating their land and now this is easily operated by the villagers concerned. Earlier, when it was installed, the Xavier Institute had deputed a person to look after it on payment basis.

The tribals who are agriculturist have been also practising fishing either regularly as a subsidiary source of income where the ecology permits it or on casual basis for their own consumption. The tribals used several variety of indigenous traps made of bamboo splinters or nets of various sorts. Now most of the tribals prefer to use nylone threads available at Ranchi as they are more strong and durable. Besides, the tribals have also taken to pisciculture as a regular and organised vocation at the initiative of the Mandal since the year 1980. Nearly 200 families of three tribal villages like Multi, Hahap and Rurumkocha are associated with it and rear the carps obtained from Fishery Department. The tribals connected with it get their affairs managed through their village councils. To catch the fish they use nylone nets which they make themselves or sometimes procure it on rent basis from fishermen living at Ranchi. The people have also learnt the technology of using ice for the preservation of fish before it is sold specially during summer season. The ice has to be obtained from Ranchi market.

The tribals have been frequently using a number of insecticides like Eldrine and BHC 10% for white-ants, and Rogor and Andrine. Fungisides like Diathyne M45 is used as a fungiside and sprayed on plants like that of potato, some variety of fruits and others. Alumunium Phosphide is another fungiside used by the people. Nearly one hundred people have acquired their own sprayer machines from Ranchi. The number of dusters are very few. The Mandal also gives these equipments on loan. Chemical manures like uria is very much in use. Some people also use improved variety of agricultural implements like iron plough, weeder and paddy-husker developed by the Birsa Agricultural University and other sources and the Mandal gives them necessary guidance in procuring and using them. Large Area Multi-purpose Co-operative Society (LAMS) operating in the area at Namkum, and Block office are also the sources from which these items are procured.

In the fifties some progressive tribal families were said to have used Japanese method of cultivation but now it has become obsolete specially with the advent of weedicide. But still many tribals realize the value of sowing seeds in lines which has its own benefits.

Rats cause a great damage to crops and grains stored in the house and many tribals besides using some chemicals mixed in food for killing the rats have started using rat-traps available in towns.

The Block provides facilities of artificial insemination with a view to improve the species of cattle. But this idea has not become popular among the tribals though nearly twenty such cases were found in which the tribals availed this scheme. It is because the tribals are least interested in milk of improved variety of cows. What they are interested in is the bullock for ploughing purpose but the foreign variety of bullocks being humpless does not serve this purpose.

Improvement in the methods of cultivation as well as introduction of wheat has necessiated improvement in the technology connected with storage and the tribals have taken to two new types of storage system. Instead of or in addition to *Mora* nearly sixty tribals have taken to the use of steel-drums. The price of a drum is Rs. 400/- but the tribals obtained it on a subsidized rate of Rs. 200/- from the Agricultural College Kanke. They have also taken to *Kothi,* a storage made of mud mixed with pieces of straw. The height of this mud-store varies from five to six feet while each of the two sides are nearly three feet in breadth. This mud-store has an inside lining of polythene to save it from dampness. It is used specially for storing wheat. Such polythenes are purchased from Ranchi.

In both the types of storage the tribals have begun using fungiside like Aluminium Phosfide. This chemical is wrapped in a piece of cloth and put inside the drum or the *Kothi* which saves the store from any type of fungus. The people also use it in *Mora,* the indigenous form of storage.

Improvement in agriculture and the advent of the idea of trade and profit, have forced them to improve their technology connected with communication. Formerly the tribals used baskets and *Sikka and Bahinga* to carry their grains but now they have devised special *Thela-Rikshaw i.e.,* a Rikshaw having flat and surrounded platform made of wooden planks and tin. It is acquired from Ranchi on an approximate price of Rs. 1,600/-. There are about twenty-two such *Thela-Rikshaw* with the tribals who use it in carrying their grains, vegetables fish etc. to market places, nearby urban centres or to the city. It is also used for fetching items of their needs. The Mandal could initially arrange most of these Rikshaw for the tribals free of cost while seven of them were given to them on loan.

Out of the six hundred three sponsored families there are seventeen families of Lohra (black smith) tribe. Almost all of them have switched over to manually operated metallic air-blower from the traditional type of air-blower (*Bhanthi*) made of wood and leather. The new air-blowing machine which has a wheel in it, is considered to be more effective and convenient and easily transportable. As a result of this new technology now a single person can manage to work on black-smithy for many purposes and they can work with greater speed. Hence many of the Lohras now make several implements like axe, knieves, other cutting implements, utensils, sickles and the like on commercial basis and take it to neighbouring markets and urban centres for sale.

Another technology to which many black smiths have partly or wholly switched over is the use of 'stone coal' (unburnt) for smithy. They feel, stone-coal gives better steam than charcoal which they used traditionally. They contact various Coal Depots in Namkum and Ranchi to obtain the coal. Usually they bring it in small quantities but initially it was brought on Truck arranged by the Mandal. The Mandal also met nearly 75% of the expenses.

The Mandal provided training in carpentry to a few Oraons and supplied all the necessary tools to them. They are doing quite well with these new and improved technology.

VIII

When we talk about technology of production of the tribals we can not ignore their "occult-technology". The tribals have been traditionally pre-literate and described as animistic with a dominent belief in magic. This gets prominently reflected in the series of activities connected with their various types of economy. This orientation of tribals and a typical 'superstitious' and conservative outlook that it generates, constitute one important factor that explains the resistence of tribals to the new technology. It would be relevant to present here a few illustration of occult-technology of the tribals.

To ward off 'evil eye', mischievous attention of evil spirits and to ensure a bumper crop or increase in the yield, Oraon and some other tribals plant on the morning of the *Karam* festival in the Hindi month of *Bhado* one or two twigs of *Kend* tree or that of *Sinduar* plant or *Sakhua* in each of their low paddy lands (Roy, 1984 : 87). Similarly, to save the crops of their upland they fix a *Charka Bhanda i.e.* a small earthen-pot placed upside down with dotted marks of lime and black soot over a small wooden pole. The *Charka Bhanda* is also used to 'save' the vegetables of a kitchen-garden. Sometimes they also fix the skull of cattle (Dangra Khochol) in stead of *Charka Bhanda*.

After harvesting when paddy crops are collected in the barn, thrashing can not take place unless *Khalihani pooja* is performed. Usually magical experts or an old person of the village is called to perform *Danda rangha* or *Bhelwaphari* in which the invitee takes a winnowing-fan containing grains of rice and some other articles. He makes a magical diagram, narrates the story of genesis and performs some rituals. It is believed, by doing it the loss whatsoever caused to the crop by evil influence so far, is compensated.

When the paddy is arranged in a heap in the barn after thrashing, many tribals put a dried cow-dung over the heap and surround it with ash-mark so that any evil-spirit (*Chonr-deva*) does not carry away the prosperity (*Sansbarakat*) of the landlord.

When a fruit-tree, specially that of jack-fruit becomes barren, two persons after they finish their meal in the night go to the tree. One of them climbs the tree while the other behaves as if he is going to cut the tree with his axe brought along with him. The other person who is climbing the tree reacts on behalf of the tree by crying; "Please don't cut me. I will bear fruits henceforth".

While going for hunting, many tribals turn round three times the handle of the grinding-slab (*Jata*) in their house. It is believed that by doing so the game-animals in the forest will accordingly lurk around the hunter and would thus be easily killed.

Such occult-technology by and large still continues though they are gradually declining on generation level specially where they are exposed to sponsored agencies like Christianity, Adimjati Seva Mandal or Governmental agencies which more or less persuade the tribals to give up superstition and suggest better and concrete alternatives. However, in several instances they co-exist side by side along with the modern technology.

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ECOLOGY AND TECHNOLOGY OF LIVELIHOOD AS DETERMINANTS OF TRIBAL ECONOMY IN EASTERN INDIA

L. K. MAHAPATRA

THIS is a partly analytical paper, seeking to expose some broad correlations, not necessarily to establish any causal relationship of deterministic nature. Of course, it will be quite in order, if any imputed deterministic relationship is shown to be invalid. For, it is easy to visualize a deterministic relationship between ecology and technology of "production" on the one hand, and the nature of economy on the other. At the outset, it may be considered whether the concept of "technology of production", as the scope of this seminar faces the danger of being restricted. "Production" has precise and specific connotation in social sciences even in anthropology. We distinguish between food-gathering and food production economies. If "technology of livelihood" is used here to refer to the technology with the means of which a group's major food resources are gathered, harvested or derived, stored and reproduced for repetitive uses, there may not be any confusion, and moreover, this may be heuristically adequate. We may also note that in anthropological context "ecology" includes social-cultural ecology. Then, there is the problem of delimiting the time and space for this paper. The recently introduced modern technology sponsored through the development institutions by the State may define the period which is outside the present consideration. While focusing on Eastern India proper, it may be necessary to take into our ambit territories or people belonging, by many accounts, to North-Eastern India. However, we may remember that at least since neolithic times, it is easy to point out cultural, inclusive of linguistic, continuities of Eastern India with North-Eastern India, even with South-East Asian regions beyond. Again, we have to analyse the multiplex relationship not only between ecology and technology of livelihood on the one hand, and the nature and type of economy on the other, but also between ecology and technology. Inasmuch as the nature and type of economy are affected vitally by the presence or absence of the state and of individual property rights in land and other resources, the limitations of the correlations may be exposed. The scope of this paper is further restricted to the societies, called "tribal" or "marginal" in India. We shall consider food gathering, Swidden, irrigated terraces and low land cultivation as types of economics.

Food-gathering people of Eastern and North-Eastern India are known in anthropological literature to be: Hill Kharia of Orissa, the Birhor of Bihar and Orissa, Parhaia of Bihar, and the

Sulung of Arunachal Pradesh, recent research by the Department of Anthropology, Utkal University, has identified the Ujia, at present included in the list of Scheduled Castes in Orissa, as basically in the same eco-technological status as of the Hill Kharia of Simli Pahar range in Mayurbhanj, and enjoying locally the same social status as the Hill Kharia, who claim the Ujia as their "brother" of the "Shabara" group. The Korwa of North-West Orissa, South-West Bihar and the adjoining region of Madhya Pradesh, was long credited with a gathering economy. All these ethnic groups used to live in the hills and forests, depending on the forest-based resources for their major means of livelihood, at least before the recent ethnographic reports were available since the beginning of the twentieth century. In technology there was a more or less uniform range of appliances and equipments; digging sticks, nets to catch wild animals, stunning fish in hill streams with wild berries having toxic properties, living in semi-nomadic existence in temporary huts while gathering forest produce, earthern cooking pots and a few other domestic tools.

When the economy of each of these groups is closely analysed, almost in all cases instability and dependency on the local tribes and castes, often under the supervising arm of the State, characterise their economy. The Hill Kharia, the Ujia and the Birhor seem to have entered the market economy of the respective regions since time immemorial, most probably before the colonial times. The Hill Kharia and the Ujia are marginal to small-scale farmers, when not landless and have developed almost a stable market relationship with lowland traders, lately also with Forest Corporation of Orissa, to trade their commodities: wild honey, arrow-root and sal resin. A good number of fledgelings of some pet birds from the hills fetch good price during some seasons. The Birhor collect materials for ropes from the forest and sell the ropes in the weekly markets that dot the fringe of the hills. All these groups have come to evolve from a forest food-gathering economy to be largely a market-oriented economy compromising with State forest laws and officials. The Hill Kharia and Ujia alternate between forest-gathering and farming or day-labour, while the Birhor migrate to some other forest areas with ampler materials for ropes and monkeys which they catch and eat with relish. The dependence of the Birhor on the market will be clearly established by determining the frequency of their cooking rice for food which they purchase. The Korwa had developed some strong tendency to depend on marginal farming.

If Surajit Sinha's hypothesis is taken into consideration the Birhor, may be Parhaia, and some other hunter-gatherer groups of today may have relapsed into a more unstable "Marginal" economy. The Hill Kharia claim that they had chiefs among them and some forts in Simli Pahar range are alleged to be their strongholds in the by gone days. However, our limited observations confirm that food-gathering economy could be said to be directly and positively correlated with a specific ecological system and technology. But the moment the State makes inroads into their habitat or circumscribes their resource base, because of the urgency and value of the forest wealth, the economy becomes destabilized till it reaches a new compromise and new level of stability of interactions and inter-dependence with the State, the market system and the neighbouring ethnic groups. The Sulung in Arunachal Pradesh, who were good hunters and gatherers, had existed in a stateless society for centuries; there was no pressure from the

State to change their economy, which had taken to Swidden cultivation in some measure; but their economy was dependent on that of the Dafla and Miji dominant neighbours, in a more or less analogous position as between the Negroes and Pigmy Negrillos in Central Congo of Africa.

If the Andamanese could be considered here, their ecology and technology could be said to be correlated almost perfectly with the nature and type of economy they had.

In all these groups there was no property right in land, forest resources or marine resources, except the right of discovery of the honeycombs among the Kharia and Ujia or similar rights of first appropriation at a particular place or time. Although sharing and co-operation in economic pursuits was not uncommon, the communal hut of the Andamanese was an exception. Hunting and Food gathering economy in Eastern India of historical times may not be credited with plentiful resources all the year round, as for example, one encounters among the acorn gatherers of California or stable fisheries of North-west coast of U.S.A., the only exception being the Andamanese. We don't find any technology developed to store the gathered food materials among the forest-based groups; this may be due to the nature of food materials collected: the tubers, roots and fruits are not amenable to storing as acorn seeds are.

As for the Swiddeners of Eastern and North-eastern India, we find them parched on hill slopes and spurs, even on hill tops, a few of them occupying the valley as well as the hill slopes in the mountainous region in monsoon India. There are two patterns of Swidden cultivation. In North-eastern India, which merges with the adjacent regions of South-east Asia, several varieties of crops are grown by planting serveral seeds together in the dibbled holes in the Swidden plot before the heavy rains. In the Eastern Indian type, the field is hoed or the soil is turned up with pick axe and major crops like paddy and pulses are sown broadcast, with the soil being turned over to cover the seeds. Among the Hill Bhuinya and Juang of Orissa the plough is used for cultivation of the soil along the contour, the hoe being reserved for the corners or rocky outcrops. So far as our knowledge goes, the Koya of Koraput also uses the plough in Swidden fields, which are on slopes of low gradient. The Hill Bhuinya case could be taken as a case of carry over of the plough to the hill slopes, as numerous plains Bhuinya are low land agriculturists. But the Mundari-speaking Juang in similar ecological setting also use the plough and like the Hill Bhuinya worship the goddess of Paddy, Lakshmi. Ploughing among the Bhuinya and the Juang of Orissa goes back to the local state system which imposed plough-tax of Rupee one per plough, which was traditionally fixed till the recent revenue settlement. Forest restrictions and shrinkage of the forest have reduced the area of Swidden, and coupled with pressure of population, have forced them to shorten the following cycle. Yearly rotation of crops, especially growing poorer millets in the third year Swiddens and leguminous pulses and beans must have saved the soil from being completely exhausted. Many families have settled down to low land agriculture on lands given by the Government. But for several centuries, it appears, their technology did not change substantially, except substituting iron scrapers for bamboo ones in North-eastern hills or using dibbles with iron point in place of a tapered bamboo point. What has most probably endured is the Swiddeners entering into the local market system for selling their "cash" crops; hill pulses, oilseeds, and for purchasing rice, cloth, spices, salt, tobacco, iron etc. The next jump for Swiddeners in Thailand and Laos etc. is to grow and sell cash crops like opium and in parts of Indonesia, to grow and sell coffee, cloves, vanilla etc. on individually held hill land.

Unlike the food-gatherers and hunters, the economy of the Swiddeners from very ancient times appears to be an adjunct to the market economy and the State system in Eastern India. Metal technology has entered the Swidden system since time immemorial. The Asur and the iron-smelters (Agaria) and fabricators like Luhura of Bihar and Orissa were too close to the Swiddeners and plough cultivators with too alluring a model to be avoided. The Swiddeners who took to the plough adapted the ploughing technique to hill-slopes; yet, ploughing the slopes might have eroded the soil more than the hoe or pick, However, the hills in Koraput (South Orissa) District are denuded of vegetation, but not so the hills of Bhuinya and Juang habitat.

So, we find the technology of Swiddeners adapted to the soil type, physiography and ecology of the hills, though the Bhuinya and Juang exceptions with plough cultivation do not seem to be completely out of place with the hill ecology. The reason why there is no significant soil erosion in Bhuinyan and Juang hills may be found in the practice of communal selection and distribution of Swidden land. In local theory, the land belongs to the village, legally the State owns it. In South Orissa the Swidden land is parcelled into individually owned plots, which does not deter the owner from over-cultivating the land, reducing it to degradation soil. In North-eastern India, communal ownership and control of land, respected by the State, coupled with higher rainfall and faster rate of recuperation of vegetation, have not allowed the Swiddens to degrade and erode the land obtrusively. It is interesting to note that in North-eastern India the tribal rights in land were retained because of the bloody fights with the British and because of the strategic location along frontiers and in the Bhuinya-Juang areas, because these tribes were politically important and Rajas had to depend on their support and hence to respect their traditional rights.

There are a few tribal groups with terraces on hill-slopes, irrigated by channelizing a hill stream. The terraces are constructed with meticulous care, often over two generations and yield paddy by permanent cultivation sometimes in 2 crops. There are also dry terraces depending on the rainfall as its water source. The Hill Saora of Ganjam and Koraput hills, the Apa Tani of Siang District, Arunachal Pradesh and the Angami Naga of Nagaland are the famous examples. Edmund Leach had once advocated the view that with head-hunting meanace all around, only permanent terrace cultivation ensured safety and food security. While this fits nicely into the Naga case and more or less embraces the Apa Tani case, as the neighbouring Dafla were aggressive raiders all around, this is hardly applicable to the Hill Saora. The Kondh are Swiddeners and the Hill Saora are both Swiddeners and terrace cultivators, even when living in the same village. If there was aggressiveness, it was indulged in by the Hill Saora who sometimes raided the plains villages, not without sufficient or cumulative reasons. However, the very fact that under the same ecological conditions and constraints, the Saora are terrace-cultivators, whereas their next-door neighbour, Kondh are Swiddeners, points to the lack of congruence between ecology on the one hand and technology and economy on the other. But once the economy of terrace agriculture predisposes the family to cling to their hard-wrought terraces, there is no surprise in the Hill Saora having joint family owning the terraced property, while the Kondh have developed no joint family, the Swidden land originally being held by the clan. The Hill Bonda, aggressive by nature, have maintained their relative isolation becuase of their hill terraces.

We may also note that the Apa Tani have irrigated terrace agriculture with hoe and no plough technology: So also the Angami. But the Saora have the plough for his terraces. It seems, hoe-cultivation of irrigated terraces was the most frequent South-east Asian trait.

The lowland agriculture in privately-owned land with plough and other technological outfit of the ordinary Indian peasant characterizes the tribal groups of middle and Eastern India, with dependence on a complement of specialist castes like blacksmith. (The Hill Saora had developed even specialized groups of braziers, basket-makers, weavers and potters among them). Here we have the Mundari speakers, the Santal, Ho, Munda, Kharia and some Saora, and the Dravidian speakers, the Gond, some Kondh, Oraon, Kisan and Mirdha, There is an interesting commentary on the ecological and technological factors when weighed against the cultural ones. The Hill-Saora are Swiddeners and terrace-cultivators, but the acculturated Hinduized Shuddha Shabara (called locally Sudha Saura) won't have anything to do with Swidden cultivation, which is a market of low "Lanjia Saora" status. Thus, in the same ecological zone on similar hill-slopes, the Kondh and Lanjia Saora are Swiddener and the Sudha Saura, terrace and low-land agriculturist.

If the economy of the hunter-gatherer is market-oriented because of internal inadequacy and instability and external constraints, the economy of the low-land agriculturist with mono-crop harvest is market-oriented and cash-crop-based because of its very nature and external relations of super ordination and subordination. In Chotanagpur and elsewhere indigenous lift-irrigation and even tank irrigation is practised for irrigating the low-land fields. In the valley villages the Bhuinya and others dam up the hill streams and train the water channel to irrigate their fields. The ecological and technological opportunities are fully utilised with the technology borrowed from the neighbours. The Ho are low-land agriculturist. Their swiddening fore-bears, the Cerenga Kulha or Erenge Kol in Orissa (in Sundargarh district) have been observed to be very successful low-land agriculturist, using traditional co-operative mutual exchange labour to advantage.

In passing, we may take note of the very few pastoral groups like the Sherdukpen of Kameng district, Arunachal Pradesh, who migrated seasonally between India and Tibetan areas of the Himalayas, the ecological constraint is very palpable and strong. Their technology was adapted to this economy based on migration, which afforded them the opportunity to be middlemen and traders between Indian and Tibetan regions.

Therefore, we may conclude that in spite of the wide range of variation in ecology, technology and economy which the tribal people of Eastern and North-Eastern India exhibited, there is a general interdependence between them. However, cultural orientations and opportunities may transcend ecological and technological deficiencies and constraints to result in an economy not logically or empirically deduced from ecological conditions or technological level.

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EMERGING TECHNOLOGY AND TREND IN SOCIO-CULTURAL CHANGE

B. K. ROY BARMAN

IN their introduction to technology and social change, Bernard and Pelto have observed "In the early days of cultural anthropology, there was a widespread interest in primitive technology and its relation to other parts of culture. Somewhere along the way, probably at the same time 'ethnology' bacame more fashionable than 'ethnography'. American Anthropologists became less concerned with material technical culture". They have referred to the views of Marvin Harris according to whom "the non-materialist bias in anthropology had its origin in the early part of the century, in Boasian-Kroeberian reaction to evolutionist thinking, and it was tinged with a bit of fear of Marxist ideological associations". In the "Rise of Anthropological theory", Harris concludes that the leading intellectual figures in Anthropology during the first half of the twentieth century "stressed the inner, subjective effects and relations. They denied historical determinism of material conditions of life. By emphasizing inscrutable values, vain prestige, irrational motives, they discredited the economic interpretation of history".

Without committing oneself to the motives ascribed by Bernard and Pelto or by Harris to the tendency shown by many leading anthrologists, to concentrate an epistemological and organisational aspects of society, one can agree that by and large, study of operational details of technology has been ignored by the anthropologists, particularly of the West during the last few decades. But this is not wholly true insofar as the anthropologists of India are concerned. For instance, N. K. Bose, K. P. Chattopadhyay and T. C. Das, concerned themselves not only with primitive technology but also with technology and related social organisation among the peasanting in India. In the sixties, one of the major projects initiated by Bose in Anthropological Survey of India related to distribution of selected traits of material aspects of culture among the Tribes and Castes all over India. Surajit Sinha and his colleagues also gave same attention to the material conditions of life in Manbhoom. Almost at the same time, the census organisation took up a study of the traditional and other village crafts of India and 138 monographs were published based on these studies. This massive work covered description of the craft objects, tools and equipment in manufacturing the objects, techniques of operation stage by stage, personal and social contexts of the crafts, pattern of interaction among the craftsmen at different stages of operation, working and living conditions of the craftsmen, network of ritual, socio-cultural and economic relationships in which the craftsmen are involved centering their craft, place of the craft in the household economy of the craft and place of the craft in the total economy of the village or the region. In many cases information available in earlier literature in respect of these crafts were compiled and comparisons were made in respect of the foregoing aspects at the time of the study. Visual representations of the crafts and the techniques were also done. Besides in several cases special studies were made of the users and pattern of use of the craft objects. Among the important findings of this study, particular mention is to be made of an urban drift of traditional crafts. Along with the same a trend of change of the users of the craft objects was noticed. Frequently the users are urbanites. Many of the craft objects were found to have demand outside the country and the users were foreigners belonging to industrially advanced countries. Pattern of change in use was also noted. Not infrequently, utility objects were turned into decorative objects.

Simultaneously, with the intensive study of a large number of crafts in the production and marketing centres, the anthropologists connected with the census, conducted a survey of specimens maintained in eight tribal museums established by the Tribal Welfare Departments of various State Governments after independence. The Regional Centre of Anthropological Survey of India, Shillong, the ethnographic section of the National Museum, Delhi, the museums of Anthropology Departments of Delhi and Calcutta University and the museum of Bharatiya Adimjati Sevak Sangha, Delhi were covered. Besides a catalogue of bulk of the specimens collected by Verrier Elwin was prepared in consultation with him. Thus descriptive accounts and background information in respect of more than 5000 specimens were compiled based on actual observation of the specimens, the records maintained in the museums and examination of ethnographic literature in those cases where museum records were incomplete. This study led to the publication of one volume which Margh sent to the press in 1967 came out only in 1984, because of the press remained closed for a number of years as a result of a court case and materials lying in the press could not be taken out. Materials for five or six more volumes are still to be published.

This survey of the tribal crafts is to be seen in the context of another work with the census had done as a part of 1961 census. It had canvassed a household schedule to each household. On classification of the occupations recorded in these schedules, with a five-digit code, about 360 villages and traditional crafts were identified to be associated with these occupations. On the other hand on classification of the tribal craft specimens maintained in the museums about 150 crafts were identified. This gave a rough index of differential in the elaboration of crafts among the peasant societies vis-a-vis the tribal communities of India. Admittedly this is a crude index; but it provides a basis for designing systematic and intensive studies in different regions and sub-regions of the country.

Mention is also to be made of the ethnographic monographs published in the 50's and 60's in respect of the tribes of Arunachal under the guidance of Verrier Elwin. One of the eraliest of these monographs is the one by Sachin Roy on Padam Miniyong. These monographs contained valuable information about technologies prevailing among the various tribes of Arunachal, with particular reference to hunting and gathering, agriculture, food production, storage and preservation, clothing, shelter, communication and transport, leisure and recreation and ceremonial activities. In 1985, based on the information contained in these monographs, a fresh survey of the specimens contained in the Central and District Museums of Arunachal Administration, supplemented by field work and information contained in the earlier survey by the census organisation, a report on handicrafts of Arunachal was brought out by the Council for Social Development.

In recent years full-fledged monography on pottery, bamboo and cane works have been published by Baidyanath Saraswati and A. K. Das respectively. Sachhidananda has brought out a publication on social dimensions of agriculture. Tribal Research Bureau of Gujarat Vidyapith has also brought out monographs and write-ups bases on their museum collections.

The list is illustrative. There are certainly many other studies of similar order. One of the reasons why notwithstanding powerful intellectual influence of the West otherwise, material aspects of culture were not completely ignored by the anthropologists in India, is that, the underlying technologies got linked up with self-reliance and cultural resurgence urge of India's freedom struggle.

In post-independence India, study of technologies by the social scientists have gone along several directions, to wit (a) factors underlying the persistence and adaptive changes of traditional technologies, (b) role of socio-cultural and/or political economic factors in determining the rates of adoption of diverse technologies, (c) impact of adoption of new technologies on society and culture.

As regards the factors for persistence and adaptive changes of traditional technologies, one can obtain useful insight from the deliberations in a seminar organised by the Central Museum of Arunachal at Shillong in 1985. Along with others, the following points were made in the seminar.

(a) The objects of material culture of the tribals do not represent technological or techno-economic sytems in isolation. Technological or economic dimension of crafts represents a sub-system with which social, cultural and moral sub-systems are closely interlinked. Technology of mass production is also making it possible for more and more persons to go in for more and more personalised leisure. In the context of the same, handicrafts have tremendous potential to come up, as expression of one's creatively rather than merely as a form of marketable commodity.

(b) There is a see-saw battle going on, between the exercise of power of the State and the initiative of the community all over the world. Handicrafts production being based on decentralisation, values of reciprocity and individual recognition, tend to strengthen the forces of peace.

In this perspective crafts and other material objects of tribal and pre-industrial societies rooted in human values and cultural heritage represent a promise for the restoration of man, under the threat of being turned into clogs industrial juggeranut. But for those in the advanced industrialised countries, who suffer from a sense of anomie in respect of mass production in mammoth industrial plants, crafts and technologies of the pre-industrial societies, not only hold out promise for the future but also serve as instruments of resistance to the inexorable march of industrial monopologies and multi-nationals.

A seminar organised by the Indian Council for Research in International Economic Relation (ICRIER) at Delhi in 1985, while noting that export of objects of cottage and village industrial had gone up from Rs. 10 crores in 1950 to Rs. 1769 crores in 1982-83, also took note of two divergent points of view. One point of view was that while there was growing demand for handicrafts in the commodity market, in family-oriented enterprises there was not much motivation to go beyond a point. Besides there was only a small market for ethnic designs. Hence the relevance of workshop-based production should be studied and much grater attention should be given on development of designs. The other point of view was that a very great care needed to be exercised about large scale production as the preservation of cultural and ethnic background of the product was a matter of paramount importance. The craftsmen themselves should be conscientised to become designers and that the traditional component of design should not be neglected just to meet foreign demand.

It is obvious that the deliberations in the seminar organised by ICRIER was more concerned with policy issues relating to handicrafts than with an analytical appraisal of the meaning of the various objects of material production in diverse human situations. Without looking into the fundamentals any attempt to resolve policy issues will lack historical validity.

The fundamentals can be examined with reference to two types of material objects: one type of object which comes under the category of handicrafts, in which in the words of Jayakar "creative energies and primeval process are released". The other relates to utilitarian goods in respect of which improvements are affected through cumulation of experience.

As regards creative craft or art objects Hall brings out the point with reference to another part of the world. "In his words "in recent years, sense-rich work of Eskimo artists has been cherished by collections of modern art, partly because Eskimo approach is similar in many ways to that of Klee, Picasso, Braque and Moore. The difference is this: everything the Eskimo does is influenced by his marginal existence and is related to highly specialised adaptations to a hostile, demanding environment which allows to margin for error. The modern artists of the West, on the other hand, have through their art begun to consciously mobilize the senses and to eliminate same of the translation processes required by objective art. The art of the Eskimo tells us that he lives in a sense-rich environment. The art of modern artists tells us just the opposite". Similar analytical study of the designs and craft objects of the tribal communities of India are still to be done. On the study of the patterns on pots, baskets, rugs, walls of caves or houses, sides of canoes, dishes and the like, Goldenweiser came to the conclusion that these representative arts conveyed 'faintest suggestions of realism'. Haddan tried to give a theoretical explanation to the same. He postulated an evolutionary development of primitive art from realistic to geometric to conventionalization. Goldenweiser however strongly objected to this quasi-chronological sequence and opined that it was wholly arbitratise in the absence of proof that the realistic specimens really represented the earlier stages and that the other specimens were later. If the evolutionary postulate of art is rejected, one cannot take a teleological view of inevitable disappearance of primitive art forms, as reflected in the crafts as well. On the other hand, it can be assumed to continue to have a special appeal as "an art of the: senses, an art which delights in liveliness, in a concentration on the essential vitality or characteristic elements of animals". Read draws attention to the dialectical nature of artistic product. It is not a by-product of social development, but "one of the original elements which go to form the society". As against this organic and vitalistic view of primitive art and craft is the view of H. G. Wells "Artistic productions, unlike philosophical thought and scientific discovery, are the ornamental expression rather than the creative substance of history". On going through the writings of many of the scholars, an arts and crafts of the tribal communities, one has a feeling that most of them have unknowingly imbibed the historicity of H. G. Wells.

But if one goes in deeper into the techniques of manufacture and use of utility goods, one finds that the perspective of Herbert Read cannot be lightly brushed aside. A study of housing technology in ten villages of Manipur, Nagaland and Assam shows that with minute adaptations the longivity of mud or mud-plastered huts with thatched roof could be extended by some people more than 30 years, while most of these houses do not last more than 10 years. On a detailed investigation it has been found that the problem is not technological; but institutional. Those who construct houses which do not last more than ten years are not unaware of the technology of making them more lasting, but in the context of the prevalence of the system of reciprocal aid in constructing houses they prefer to opt for a technology which will require them to accept less aid from kins and neighbours, so that in their turn they will also have to render less aid. Such instances can be multiplied, but for the purpose of the present discussion, perhaps this will serve the purpose.

Socio-cultural factors in transfer of technology

Up to mid-seventies the concept of modernisation largely hinged round transfer of technology developed in the West in the fields of agriculture, animal husbandry, health care and so no. Frequently, however, the rejection rate was found to be quite high and considerable theorisation was done by the social scientists on cultural barriers to adoption of the "imporved" technologies. But of late questions are being asked whether any technology can be evaluated in isolation. There is a growing volume of literature on appropriate technology. It is not proposed to go into the same in this paper. Rather impact of new technologies, whether endogenously developed or exogenously adopted will be examined in a rapid ever viewed.

Impact of new technology

Impact of new technology can be considered at the level of micro and simple technology; it can also be examined at the level of macro and highly sophisticated technology. The focus of this paper primarily relates to the first category; only a passing reference will be made to the technology of the second order.

A study in a cluster of villages in Hooghly district of West Bengal shows that on installation of deep tube-well and of H.Y.V. paddy, pre-kharif cultivation of paddy became quite wide-spread. But as it required input at a larger scale than that in case of conventional kharif paddy cultivation, also as it involved contact with power elite for obtaining the requisite inputs at the right time, the traditional share-croppers and marginal farmers could not go in for such cultivation. A new system of contract cultivation (thika) developed. Young men belonging to medium farmer households, either singly or through forming group organisations took land in short lease, only for the pre-kharif cultivation from the marginal farmer. Here the tenant-landowner relationship assumed a completely different meaning from such relationship which prevailed under semi-feudal or feudalistic mode of production. Along with such change in political economic relationship, certain changes in normative aspect of social action also came in. For instance traditionally it is unthinkable that son of the high caste middle peasant would carry paddy stalk as head-load; but when thinka is taken by a youth, club or organised group, such action does not attract any opprobrium.

Adaptive changes were noticed on adoption of small tractor. A middle class youth who would not handle the plough, would operate the small tractor to till the land, resulting in changes in the traditional pattern of inter-dependance in the village. On introduction of shallow and deep tube-wells new problems of social relationship have also come up.

An interesting development relating to the introduction of bio-gas has been noticed in some Birbhum villages. At this moment, there are about 6000 bio-gas plants in Birbhum villages. It is reported that people prefer to marry their daughters off to families which have bio-gas plant as it reduces the labour of women in cooking and cleaning the utensils.

One can assume that development of solar technology will radically after the habitat pattern and many of the problems of ecological disruption, linked up with generation of hydel and thermal power, will be reducd. In fact, it has been suggested by competent scholars that if in the sixties policy decision was adopted in the industrialised countries to make massive investment in the field of utilisation of solar energy rather than in nuclear power, the bulk of the energy needs of to-day could have been met from this source. But research in nuclear energy was stepped up as a strategy of maintenance of hegemony in global power structure. Before closing this discussion, particular mention would be made of one aspect of technological development in India. Even in modern industries like textile mills of Ahmedabad, it has been found that various operations are caste and community linked. If adoption of a new technology relegates the importance of a particular operation the resistance comes from the ethnic group associated with that operation. This leads to inter-ethnic conflict and technological change becames problematic. The casualties is development of industrial democracy and ultimately the development of a rational egalitarian society.

TECHNOMORPHIC ART OF INDIAN TRIBES

A. K. CHATTERJEE

ABSTRACT

Art and craft in tribal society are not entirely a quality of things and objects as in modern society, which are otherwise prized, independent of their artistic value. Artistic activity is the basic type of human social activity. The purpose of art and craft in tribal life is both religious as well as secular. These are also both utilitarian as well as ornamental. Tribal art and craft are not appendages of religion or economic activity, not are, these divorced from life, rather these are part and parcel of life. These are the autonomous activity integrated within the totality of social behaviour.

In this paper author tried to classify the different types of art and craft of the tribal people of North-Eastern India and tried to identify the functional significance and value system of them. Author also tried to focus how we may look deep into the whole structure of a tribal society through their art and craft. He also tried to prove the earlier idea regarding the tribal arts and crafts that "they are ignorant of art and manufactures" is baseless.

The scholars and researchers in the field of ethnography failed to understand the artistic talents possessed by the tribal community. The author feels that now due to contact situation and assimilation of culture the traditional customs and beliefs of the tribal people are in changing situation, eventually the traditional art and craft of the tribal people are also be subjected to continuous transformation and decay.Traditional arts and crafts have been loosing their traditional meaning to the new generations. Tribal art and craft, their designs and patterns and values that belong to a time and pattern of culture, that is giving away to the new values and orders.

The author also tried to assess the effect of ecology and economy on the tribal art and craft and how the tribal development of their art and craft introducing modern technology.

The author thinks the revival and retrieval of the tribal art and craft should be considered as natural problem, if we think for the proper socio-economic development of the tribal people of this country.

Art and craft in tribal society are not entirely a quality of things and objects as in modern society, which are otherwise prized, independent of their artistic value. Artistic activity is the basic type of human social activity. The purpose of primitive art is both religious as well as secular. It is also both utilitarian as well as ornamental. Primitive art is not an appendage of religion or economic activity, not is it divorced from life; it is part and parcel of life, an autonomous activity integrated within the totality of social behaviour. The artistic activities of our primitive contemporaries are of following types:

(1) Plastic and graphic arts:
  (a) Carving and engraving of designs of various types, realistic and geometric, in stone, wood, ivory, metals
  (b) Sculpture in metals, bone, wood, stone
  (c) Clay modelling and toy making
  (d) Painting of all types including murals, wall and floor paintings and painting on pottery, *textiles,* and hides
  (e) Weaving of patterns into textiles and basketry
  (f) Tatooing
  (g) Personal ornamentation including dress and hair styles

(2) Oral literature:

Oral literature includes folk tales, folk songs, proverbs, myths and common sayings.

(3) Music and dance:

Music and dance include various types of instrumental and vocal music and also various types of dances and dance dramas

Textiles, weaving of patterns into textiles come under plastic and graphic arts

Much attention was not given to study the artistic efforts of Indian tribes in the pre-independence age. But in the post-independence period the Ethnographers and Scholars having an inclination towards the helistic study of tribal art as well as the culture. But in South America and in Africa, similar type of study *i.e.,* study of tribal art has been conducted for a long time back. In our country Ethnographers and Scholars failed to notice the artistic talents possessed by the tribes and even they came into conclusion that the tribal people are 'ignorant of art and manufactures'.

This type of baseless idea was probably based on superficial field survey and haphazard and untrained thinkings. Those scholars could not find the artistic talents of the tribes because they could not differentiate the forms of traditional art and its media of expression and more over they failed to identify the functional significance and its value system.

Prior to V. Elluin, there are casual references about tribal art or any ethnographical accounts. After Elluin there was a vacuum in the study of tribal art in our country. During the late sixties contribution by N. A. Ao and in the early seventies by Dr. Kopper extended the horizon of study of tribal art (Textile comes under it).

A few other important names must be added at this juncture, *i.e.,* Dr. A. K. Das and Mrs. Nilima Roy both of them contributed a lot in this field, publishing their research work on "Tribal Art and Craft" (By A. K. Das in 1978) and Manipuri textiles (Nilima Roy in 1978).

In spite of all these research works, more intensive analytical study of the tribal art of India specially in the field of graphic and plastic art putting much emphasis on textiles is yet to be made. These responsibilities are lying with the Anthropologists, who are working in different Museums in India.

The tribal art forms are varied and diversed. So it is very difficult to categorise and classify them. Broadly they can be classified into two groups:

(1) Performing art

(2) Non-performing art

The non-performing art forms can be categorised in an evolutionary sequence which are as follows:

NON-PERFORMING ART FORMS

(1) *Non-bodic*

Personal adornment (Tatooing, Painting on face to body etc.)

(2) *Technomorphic*

(a) Textile
(b) Basketry
(c) Mat work

(3) *Graphic*

(a) Wall painting
(b) Scroll painting
(c) Painting on wooden objects
(d) Painting on weapons

(4) *Plastic*

(a) Two dimensional:
  (i) Surface burning
  (ii) Paker work
  (iii) Relief work
  (iv) Engravings

(b) Three dimensional:
  (i) Wood carving
  (ii) Masks
  (iii) Terracotta
  (iv) Metal crafts
  (v) Ornaments

Tribal art objects are people art and these are *more or less institutional*. Dr. Elluin was on the opinion that various traditional Institutions are responsible for stimulation of the artistic pursuits. The sponsoring Institution of the tribal art vary from area to area with the motivational change. The head-hunting Institution of the Naga tribes of the N.E. India has been the sole inspiration of the tribal artist in the past. The bachelor's dormatory among the tribes such as Konyak, Phon, Muria, Maria, Juang, Oraon has been playing a vital role in the artistic creativity for a long time. Various religious Institutions and the Institution of totemism among the tribes of (M.P) (Gujrat) has been the motivating factor for the wood and stone carving. The practice of human sacrifice among the Kondh of Orissa resulted in production of objects of art. The monastic Institution of the Buddhist tribes of Sikkin, Bhutan and Arunachal Pradesh, Nagaland and Manipur *i.e.,* N.E. India tribes. The Chiefs of this region are well known for their patronage in the field of tribal art and crafts. The intimate relationship of the tribal art with marriage ceremony, puberty rituals rites connected with child birth etc., may also be noticed.

The tribal art may be considered as a codified system consisting of signs and symbols and this is the traditional language of communication. We must, therefore, be well versed with the socio-religious attitudes and values of the tribal society to understand it.

Some of the tribal art are profane but a large number are the existing evidences of religious norms and world view. The significance of God and spirits and the malevolent diety are all evident in the tribal art.

Details of some technomorphic art of the tribal people of North & North-East and Southern India

Bodokachari is the main tribal group in Assam. They are known as *Meches* in West Bengal. The northern branch of this group is known as *Koch.* The other branches are *Iimasa Kachari,* Rabha, Hajong, Garo, Sauing, etc. Besides Kachari, the other groups are Mikir, Kuki, etc. The tradition and history of the *Bodo* people can be traced to early-Mongoloid or Kirat movements. Saigal staged that the Kirat entered India through the Brahmaputra valley about three thousand years ago. The Kirat as geographical and ethnic nation includes the Himalayan tribes, the *Bodos,* the *Nagas,* the *Kukis,* the *Khasis,* and the earlier tribes, who have now become absorbed in the plains population of Northern and North-East India. The *Bodos,* are the most important of the Kirat tribes and constitute the basic present-day population of these areas. They first settled in the Brahmaputra valley from where they gradually spread over.

They believe in supreme being and other malevolent spirits. Their language and dialect belongs to Sino-Tibetan family (Saigal '78). All the above-mentioned tribes know the art of weaving particularly 'eri' cloth weaving.

The *Khasis* and *Garos* of Meghalaya know the art of weaving. *Manipuris* and most of the adjoining tribal people are generally good weavers. In Tripura, *Tripuri, Riang* and *Jamatia* tribal people know the art of weaving and dyeing. In Mizoram, *Mizos* know the art of weaving and the art of dyeing. They also learnt the cotton cultivation in the past and cotton was used for their dress. *Hill Miri, Mikira, Mishmis* of Arunachal Pradesh know the art of weaving also.

In Orissa, the *Kondh* tribes are large in number. They also use the simple type garments made of coarse cotton and of different colours, such as—*Dabedi*—a piece of coarse cotton cloth, off white in colour with red stipes and designed black and red borders, used by the females.

'DEPEDI' : Off while coarse cotton cloth with red and black checks. Used by the female of the *Kondh* tribe for covering the lower part of the body.

'GAJI' : Marriage cloth for male. Coarse large cotton cloth with stripes of blue, red and yellow. Prepared in their simple type of loom in indegenous method. Used by the bride-groom at the time of marriage.

'DIPEDI' : Marriage cotton cloth. A thick piece of coarse coloured cotton cloth used by the bride at her marriage . Maroon coloured stripes executed against sky-blue background other side is designed with broad yellow striped.

Mundari-speaking *Gadhaba* tribes of Orissa is famous for their bark cloth known as:

'KERENG' : It is large in size, made of Kereng bark threads, thick coarse, decorated by red and blue stripes at regular interval. Weaved by the ladies in their own indegenous method using their simple type of loom. It is traditional bark cloth and at the time of festival.

Rabha tribes of West Bengal used the following garments:

'LUFUNE' :	Skirt cloth: unsewn brown female garment when put on, appears in the form of a skirt. Short piece of cloth with highly decorated lower portion against black background.
'KAMANG' :	Breast band. Coarse cotton cloth decorated and designed with brown lines and yellowish thread.

The tribals of Baster (M.P.) live in a world of endless varieties of rhythm, colour and form and all their social, religious, economic and cultural activities, find expression in their crafts, personal adornments, etc.

Ornamentation and personal adornment plays a vital role in their personal life, wearing various type of necklaces, bangles, etc. The Bisonhurn Maria head dress is must for men during their dance. The impact of urbanization and industrialisation on the tribal art is quite evident in Baster (M.P.). The art is changing incorporating many new ideas, style and form. A time is not far when their artistic tradition will disappear completely without leaving any trace.

The Andamans and Nicobars have been inhabited by two entirely different races. The Andamanese belong to *Negrito* race and the Nicobarese on the other hand, resembles the races of *Indo-China and Malaya.*

Hibiscus fibre is used mainly for making hunting articles of turtle and big fish. So the ornaments of libisens fibres are worned at the time of eating. The Andamanese also believed that the wearing of bones of animals they hunted too, had . . . . . The human skull and mandible belonging to the recently dead relatives were worn as a mark of affection and respect. Details of their dress materials are presented below:

THE GREAT ANDAMANESE DRESS

1. *"CHIRBELE"* rope girdle:

(i) Hibiscus fibre is twisted into a single stravel. Around this yellow skin of the Dendrobium are wound spirally so that it is covered entirely and this strand is twisted into a two-ply cord.

(ii) A net of hibiscus fibre interwoven with the Dendrobium skin is made into a tubular net of 3 cms in diametre and filled with some bark. It is tied around the waist. This rope girdle is used by men in ceremonial occasions.

2. *"TOTO"* leaf girdle:

To a strap of Pandanus leaf, fibres of Pandanus leaf are attached like a screen for covering their genital organs of a wearer. The ends are tied together and on the two sides, 5 to 6 shells are suspended by thin stripes of Pandanus leaf so as the shells hang on the sides of the thighs and make a tingling while walking and dancing. It is worn by females.

3. *"TOUCHOH":*

A strap of Pandanus leaf of about 3 cms. of breadth, a number of shells are suspended serially by strings. This is used by both sexes below their knees and arms while dancing.

THE ONGE (LITTLE ANDAMAN)

1. *"CHENADALU":*

The closed ends of the dentalium shells are bitten off with the teeth and the shells which form cylindrical heads, are strung on to a piece of thread. These strings of shells are tied around the waist of the women.

2. *"KOL"* Ornamental Cord:

Long and thin cave strip with a very fine yellow skin of Dendrobium is placed and wrapped with a red coloured thread. This yellow and red stripes are worn around the waist. Sometimes a good number of stripes are also worn around the waist like a belt. This type of belt is as good as dress and used by both the sexes.

3. A *'TASSEL'* of fibre made from young unopened palm leaves, is worn by women to cover their genitals.

THE NICOBARESE

The Nicobarese of Nicobar Island are horticulturists. The dress of the Nicobarese consisted a long piece of cotton loin cloth called "KISAT" and a turban or a cap. The loin cloth was tied around the waist with one long end hanging behind in manner resembling a tail. White Head (1924) opined that the Nicobarese were not only a naked people but also had a tail.

The women were wearing fring like skirt, called "THINONG" and blouses of grass of split coconut or *Pandanna* leaf. The skirts were of three types and worn one over the other on occasions like dancing. The inner skirt was six inches long and others a foot of each. The leaf skirts and blouses were confined to Chowra and Teressa Islands. In some island among the *Shempen* bark cloth was used for the purpose of clothing. Now the women have largely taken to Burmese dress of lungi and blouses. In some islands where the contact with the outside world are less, their old and some younger women while working, usually go bare on the upper portion of their bodies.

Spinning and Weaving

In North-east India, spinning, dyeing and weaving are exclusively controlled by the female folk. In Arunachal Pradesh previously the textile weaving is comparatively limited among the Adi, Mishmis, Apatani and the Buddhist tribes. Textile patterns of these tribes are invariably geomotric. Most popular motifs are diamond, Zig-zag line and angular patterns. The floral and geomorphic patterns are more or less in geometric form. Even now simple and straight lines, stripes and bands are the most common designs. Contrast and combination of colours are often made. They generally used vegetable dyes. The common colours are black, yellow, dark blue, green, scarlet and meddor. Vegetable dye is obtained from the wood, bark, leaves, shoots, wild flowers and fruits of certain plants. The hair of goat, dog and even monkey is sometimes used by the remoter tribes. So far as design is concerned, Adis and Apatanis concentrate on straight lines. The Adis bands whether horizontal or vertical are often enhanced by a sort of hatching-rows of colour dots, single lines of different colours. Different shades are achieved by mixing threads of black with other colours. The Apatani use broad bands alternating with narrow lines in their cloth. Another style of cloth is white with borders of blue mixed with redlines and a few vertical stripes of red, green and white. Mishmi weaving is much more elaborate, though there to the straight line and hand is frequent. The zig-zag pattern is only found in the Wanchoo bag, Herring designs are found in the shawl of Apatani priest and in the Wanchoo and Mishmi coats. Luzenge and diamond patterns are found among the Idu Mishmi. They are woven on shawls, skirts, coats and bags. The Monpas are expert weavers. Monpa women weave in wool cotton and bark fibre. They extract fibre from the Rheanivea and other plants. They have their own dyes which give them black and various shades of red and yellow. Besides textile weaving the Monpa women weave colourful carpets of dragon design on them.

In Nagaland, cotton is plentifully grown in the villages on the lower hill sites. The cotton is seeded by a small wooden machine which is manufactured by the Kocha Nagas. The spindle which spins out the seeded cotton is called "themwu" and the loom is a simple kind of tension loom. The Nagas use dark blue, red and rarely yellow dye. The vegetable dye is obtained from leaves, shoot, bark of certain trees. The blue dye used by the Nagas varies from light blue to about black. "The red dye is less used than the dark blue. One of the reasons is that red colour being the colour of blood, a young woman using this colour in dye operation is believed to die or lose her head in a raid." (Government of Nagaland, 1968). Yellow dye is used only by few tribes.

Naga women are very expert in getting the exact shades they prefer. The designs vary from a formal arrangement of lines to elaborate pattern of diamond and lozenge shapes. Simple and straight forward lines, striped, squares and bands are the most traditional designs. On the skirt and shawls the stripes and bands are usually horizontal. In recent years familiar objects are often added to their original designs. Different types of the Naga shawls range from very simple white cloth to the elaborately designed warrior or rich man's shawls. One of the common features of Naga shawl is that three pieces are woven separately and stitched together more or less the same pattern. In case of skirt for children and women the stripes are reduced to two only.

In Meghalaya the Garos weave their own cloth, Garo women manufacture mainly 'Dakmandas'. The 'Dakmandas' (2 meters×1 meter) is a wrapper worn by women-folk beautifully decorated with their own indigenous design, the colour schemes and various type of designs like flowers, butterflies etc., are remarkable. Both the borders of the 'Dakmandas' are decorated with three equal rows of diamond design spreading to a width of about $\frac{1}{3}$ metre. Apart from 'Dakmandas' they manufacture some other fabrics for their daily use. 'Amfak', a blanket made of bark, is still popular in the interior part of the Garo hills, strips of barks of pharkam tree are taken out, these are pounded to make them stretched. These are then put in the sun. The bark sheets then stretched to be used as blanket or as mattresses. The Khasis and the Jaintia tribes had also certain original designs in handloom fabrics. But weaving in Khasi and Jaintia hills now-a-days is practically negligible.

A form of textile found mainly in Khasi hills is derived from pineapple fibre. These fibres are generally used for making bags.

The Mikir women folk are expert in weaving. The cotton generally grows in their field. They also know the art of manufacturing eri silk and weave it into coarse fabrics of blanket used in cold weather. They dye their thread with indigo. They also know the use of red dye. In Assam the Kacharis know the culture of silk worm, known as eri and manufacture of eri cloth. The loom employed for weaving the eri silk is of simple construction and the villagers themselves make it. The eri cloth is woven long strips about 2 yards wide. This fabric cloth is generally used in the cold seasons being soft and warm as well as remarkably strong and durable. They make geometric designs sometimes floral and faunal designs used by the Kachari women. The Manipuris are generally good weavers. The quality of the Manipuri clothes is still good. They generally use looms of loin type. They dye their clothes and yarns with the help of some plants and some varieties of earth. Many of the plants cultivated as dye crops. A kind of earth found on a hill named "Kaina" and it yielded a beautiful yellow colour. They are also expert in embroidery work. The borders of the skirts are generally embroidered with silk. The designs of embroidery are flowers, birds, animals, etc. Indigenous textiles pattern is invariably geometric in form.

Naga clothes were originally made of entirely local materials. Cotton on small scale is grown in many areas, Lothas, Rengmas and Aos were great cotton growers and used to sell to the neighbouring tribes. In recent years, Mill-made yarn is readily available in the market at cheaper price so the production of cotton and the indegenous spinning is fast losing in the face of market competition. Weaving is becoming more popular than before and the new designed in textile have become more varied of late.

Spinning, like dying and weaving is performed by women and every Naga woman is supposed to weave clothes of her family. The process of spinning is primitive and a few simple tools are used in the whole process. The cotton is cleaned of its seeds by having rolled on a flat stone with a short stock used like rolling pin. The work of seed cleaning is generally done by the old women who being no longer able to go to field.

The dyeing process takes place after the yarn is transferred into skoins. The indigenous colours in recent years are replaced by chemical dyes. Further the easy availability of coloured thread in the market does not encourage the necessity of producing the old indigenous colours. The Nagas use dark blue, red and yellow dye. The whole process is carried out by women who are also taboo among some tribes to handle any dye during pregnancy as they think the foetus be effected by the colour. Blue dye is obtained from the leaves of the *Strobilanthes flaceidifolins*. This is a universal Naga dye and the plant is grown in the gardens of the villages. Blue dying is used in autumn and early winter. The Angamins prepare red dye from the root of a local creeper (Isenyhii). Yellow dye is made from the wood of a plant called "athuo". Use of the dye of any colour is restricted before harvest as they feel that the process is in some way detrimental to crops.

Unlike other parts of India, where much of spinning and weaving is in the hands of female, but in Nagaland this work is the exclusive monopoly of women.

Conclusion

Now due to contact situation and assimilation of culture the traditional customs and beliefs of the tribal people are in changing situation, eventually the old art may also be subjected to continuous transformation and decay. Traditional textile and dress head gear etc. have been loosing their traditional meaning to the new generations. Tribal art objects, their designs and patterns and values that belong to a time and pattern of culture, that is given away to the new values and orders. At this stage the revival and retrieval of the tribal art should be considered as national problem.

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ETHNOGRAPHIC MUSEUM: A STUDY AND RESEARCH CENTRE FOR TRIBAL AND FOLK MATERIAL CULTURE

SABITA RANJAN SARKAR

MUSEUM is an institution. Collection of specimens—their accommodation, preservation and presentation are its primary functions. Three dimensional concrete material objects with relative importance in specific fields like science, culture, history, aesthetics etc., are generally collected for a museum. Organization of dispaly with these collected materials to expose them to the visiting public for impartation of visual education is now considered as one of the most significant functions of this institution. So much importance is given to this sphere of activities that a museum is at present counted as the institution of visual education.

The functional role of a museum has undergone revolutionary change when it has attained the status of an educational institution after the Second World War. All round efforts are now being made to collect relevant information related to a specimen at the time of collection and also on subsequent occasions whenever the opportunity arises. When a specimen is brought to the museum from field, it gets itself dissociated from the cultural environment where it is prepared and made use of.

Cut off from the cultural environment the specimen all alone within the four walls of the museum fails to furnish requisite information necessary for making its study as a cultural element. Associated field information are, therefore, absolutely essential for the study of a specimen within the museum premises. A museum with adequate number of specimens of relative importance supported by associated field data is now recognised as a research institution. A functionally potential museum both as an institution of visual education and research centre caters to the need of all the sections of the population—illiterate, semi-literate, literate, students, scholars and general public. In view of its important functional role, the institutions of different disciplines are very much interested to set-up museum within their respective fold to utilise them for the sake of study and research. Anthropology, a discipline dealing with the holistic study of man is of no exception. A museum comprised with the specimens affiliated to anthropological discipline is referred to as anthropological museum. An anthropological museum harbours the specimens of three broader branches of the subject—palaeo-anthropology, physical anthropology and cultural anthropology.

The term ethnography is traced in the domain of cultural anthropology. Descriptive account on the cultural life of a community is referred to as ethnographic account. Ethnography as a term is related to the study of culture. The cultural artefacts are, therefore, mentioned as ethnographical objects in anthropological discipline. When an anthropological museum is developed either exclusively or mostly with ethnographical specimens, it is designated as ethnographical museum.

An ethnographical museum with the help of cultural elements accommodated therein, contributes much in making the study of human culture. Human culture is not static. Due to its dynamic nature, culture is in a process of change either slowly or rapidly depending upon the situation. Man made utilitarian goods—the product of human culture also undergo changes with the cultural change. These artefacts are the real representative examples of human culture. As such they focus the pattern of culture. The ethnographical objects, known as cultural artefacts are, therefore, preserved in the museum to maintain the relics of traditional culture. It is through these relics traditional culture may be studied conveniently. In the reconstruction of cultural history, these records may be profitably utilised. Hence the role of ethnographical specimens *vis-a-vis* the ethnographical museum is quite significant in supplying the materials for the study of culture.

Culture has two distinct divisions—tangible and intangible. Museum is a centre of visual education. Visually perceptive three dimentional concrete material objects therefore get top priority in the museum for discharging its function. An ethnographical museum is built up with the tangible aspect of culture. The intangible aspect which is visually imperceptive has very limited scope in this sphere. The cultural artefacts with concrete material existence come under the tangible aspect. As such this aspect of culture is referred to as material culture.

Constituted by the elements of material culture an ethnographical museum may be utilised successfully as the centre of study of this aspect of culture. Only the collection of specimen will not serve the purpose to build up a museum functionally potential. Associated field data along with specimens must be there for their fruitful utilization.

An ethnographical object, representative example of material culture is the combined output of raw material, cutting tools and technological knowledge. The anthropological study on technology strictly confines to the level of simple technology. Therefore, an anthropologist makes the technological study of the tribal and the rural folk who are the bearers of simple technology. Simple technology as practised by these people is traditional and is propagated from generation to generation by way of practical training received by the members of one generation from the preceding ones. It has nothing to do with any institutional training.

Both the tribal and the folk cultures are regional. A regional simple culture generally remains confined to a particular region. It is built up in conformity with the local need. Locally available raw materials are mostly used for manufacturing the articles of daily use. The selection of raw materials again depends upon their availability, level of technological know-how of the people and the cutting tools they use for processing them. Raw material, tool type and technological knowledge are so integrally related to one another in giving concrete shape to a material object that if the tool is crude enough in relation to a specific raw material, even the technologically efficient people are not in a position to utilise the same material.

Again if the people are technologically deficient, they may not utilise the raw material effectively with the tools which are adequate enough to deal with the same. Therefore, raw materials, tools and technological knowledge work in complete co-ordination in tradition bound simple tribal and folk societies in giving rise to the trend of their material culture. In the study of tribal and folk material culture these three factors are, therefore, primarily taken into account.

The material culture of the people practising primitive technology are also very simple. They mostly manufacture articles urgently required to satisfy their primary needs for maintaining their very existence. They do not give much importance to the objects necessary for making their life more comfortable materialistically without paying due attention to satisfy their secondary or tertiary needs. Their material belongings are, therefore, very much limited in number primarily confining to house for accommodation, dress for protection from wild nature, offensive and defensive weapons for self protection, equipment for subsistence activities, domestic utensils and ritual objects.

The people of simple technology thrive on different economic pursuits like hunting, fishing, gathering, horticulture, agriculture, pastoral economy and production of simple handicrafts. They are very much concerned with subsistence activities for their very existence and pay scanty attention for the materials objects of personal comfort. Artefacts concerned with such activities are by far the most important items in their material belongings. Cultural artefacts related to subsistence activities are, therefore, very much counted in an ethnographical museum and varities of such artefact with due importance are accommodated in this institution.

The simple folk depend on nature for their subsistence. They collect food from nature. But they are not in a position to harness nature with their simple technology to derive advantage in their favour. They select the items of food depending on their availability in the region and also on their scope of collection. Importance of an item of food again depends on its quantitative availability as well as taste. Seasonal variation in food items is witnessed among the people of simple technology as they depend to a large extent on the seasonal fruits and vegetables. Extent of hunting and fishing as practised by them also vary to some extent in different seasons of the year depending on the local natural condition. They practise agriculture and produce food grains taking advantage of the regional environment. Not to speak of the food-gatherers even the simple agriculturists procure their protein diet by way of hunting and fishing. The level of their technology often stands in the way of exploiting nature effectively.

The tribals and the rural folk have effectively dealt with the matter to overcome their technological deficiency in their own way. As the shrewd observers of nature they studied the life cycle of wild animals, fish and plant. Impact of nature in their life cycle has been critically observed as well. Accumulated experience derived from shrewd observation through the ages has paved the way for successfully collecting the natural food.

Suitable ways and means have been devised out of their accumulated experience. Though simple but ideal equipments have been introduced in conformity with their technological knowledge. Their manipulation technique has also been devised to exploit the nature to their advantage. It is, therefore, apparent that the equipments related to the subsistence pattern have direct bearing with the local physical environment. In other words the people of simple technology have devised the structural part of equipments, their manipulation technique and production technology strictly in relation to the nature to exploit it as best as possible within the scope of their technological knowledge. Hence a specimen of material culture, particularly associated with subsistence activities may best be understood in the cultural context in terms of ecology (physical environment) of the region, economic activities (subsistence pattern) of the people and technology of production of the producers. It is thus apparent that an item of material culture related to the subsistence activity may best be studied in terms of ecology, economy and technology of the people to understand its cultural significance.

Technology bears direct relationship with the economic activities. Economy casts its influence on the social structure and the social organization of the people. It does not spare the religious life even. Hence the study of material culture offers the scope of understanding at least partially the socio-religious life, the intangible aspect of human culture.

Extensive field-work is necessary to cover all these aspects of material culture for study purposes. Specific anthropological methods are needed for successfully carrying outfield-work. Collection of specimens is of paramount importance provided the field-work is sponsored by a museum. Cultural anthropologists are the competent scholars in making such field study. Related field-data concerning the collected specimens are absolutely essential for study purposes. Pictorial documentation of the specimens in their cultural environment as supporting field-data is required as well. For the collection of specimens as well as the field-data to build up the national ethnographical collection and also to utilise the same as the materials for anthropological research on material culture, the Anthropology Section of the Indian Museum has adopted a definite collection policy which is as follows:

1. Anthropological collection is being made directly from field by undertaking extensive field-work by the competent anthropologists attached with the Indian Museum with a view to collect genuine specimens of traditional culture together with field-data essentially required for research work.
2. Distant places in tribal belt and rural areas with little communication facilities and lesser scope of acculturation are being selected for field-work. The idea behind this proposition is to have the relics of traditional culture conveniently as they are not easily traceable in the areas with modern communication facilities offering wider scope of acculturation.
3. In the selection of tribal folk, emphasis is given to those who are less acculturated and still cling to their traditional culture to a great extent.
4. Not only tribal cultural artefacts, but the elements of folk culture are also being collected.

5. The representative examples of material object associated with all the spheres of cultural life of a tribe is being collected. It means that the collection from a tribe is being made holistically.
6. Importance is also being attached to the collection of individual culture traits like mask, musical instrument etc., which bear distinct cultural significance in tribal and folk cultural life.
7. Newly introduced cultural elements in tribal life are also taken into account in collection specifically to study the changing pattern of culture from tradition to modernity.
8. All possible anthropological methods are being applied to collect the field-data associated with a specimen both by theoretical interviews and mechanical devices like tape recorder, camera etc.
9. Much emphasis is being given for visual documentation of material culture in field situation.
10. To avoid omission in any specific aspect of enquiry for the collection of field-data related to a specimen, structured interview is taken through prescribed schedules.
11. Documentation of specimens in different levels is done for maintaining the record of collection appropriately in the museum.
12. Collected field-data are maintained in systematic order to utilise them at the time of need.
13. Newly collected specimens are put on display by organising temporary exhibition. They are next kept in the reserve in systematic order for making them easily available both to the museum staff and the outside scholars for study purposes.
14. Original specimens together with associated field-data, photographs and other related information are utilised in the preparation of paper by the museum staff for publication in the Museum Bulletin to highlight the research oriented activities being carried out in the field situation by the staff members of the Indian Museum. Similarly study facilities are also extended to the outside scholars.

How this collection policy of the Anthropology Section of the Indian Museum is being translated into practice, is being described hereunder citing an example:

The Indian Museum is situated in the city of Calcutta located in the eastern part of the country. In formulation of its collection policy, it has, therefore, been tentatively decided that the anthropological collection of the Indian Museum may broadly be built up with the tribal artefacts and the elements of folk culture from Eastern India. Accordingly different tribes of this region have been selected to collect the representative examples of their material culture. In the selection of tribes for the purpose, special emphasis has been given on the scope of acquiring the relics of their traditional culture. Culture significance, if any, is also taken into account in making the selection. Whether adequate collection of the tribe is already there in the museum or not is looked into as well. Scope of collection and communication facilities are explored in taking up the work.

Geographical distribution, habitat and economic pattern etc., of the tribes concerned are carefully considered in making their selection. How this collection policy is being followed, is enumerated below citing the example of collection made from the Rabhas of North Bengal.

Analysing the anthropological collection of Eastern India now under the possession of the Indian Museum, it has been found that the tribal collection from North Bengal is rather insignificant. It was, therefore, decided to make some collection from this geographical belt to wipe out this deficiency.

Among the tribes of this region the Rabhas was picked up at the outset. The reasons are obvious. Culturally and economically this tribe exhibits certain peculiarities of their own. They are matriarchate and inhabit Tarai Region, the sub-Himalayan forest belt. As the forest dwelling Mongolid tribe they bear certain peculiarities in their material culture in conformity with the local ecological condition and forest oriented subsistence economy. With the decline of forest and establishment of better communication facilities in the remote forest areas dominated by this tribe, their traditional culture is now in a process of transition by way of steady and fast acculturation. Acculturation has so far taken place to such an extent that the village Rabhas (the Rabhas living in the villages in the midest of non-Rabha population) have almost given up the use of their traditional cultural artefacts. But the Jungle Rabhas living in the forest with lesser scope of acculturation are still using their original artefacts to some extent. Hence, the collection trip among the Rabhas was kept confined within the Jungle Rabhas only.

Field preparation

After the selection of tribe, bibliography was prepared to collect the published data on the cultural life of the Rabhas, with special reference to the material culture. This was done to trace out the pattern of traditional culture and the cultural artefacts used in their day to day life and on festive occasion before acculturation took place significantly. It was through the published literature preliminary idea about the traditional cultural artefacts was formed. This idea helped much in acquiring the traditional cultural ralics on the field situation. Side by side accounts were also taken down from the appropriate publications on topographical condition, river system, flora, fauna, rainfall, climatic condition, temperature and other factors which are taken into account for considering the natural habitat of the region. Information on the typical features of the natural forest of Tarai Region, were gathered from the report of the Forest Department. Information were also gathered on the introduction of the plantation of economically sound wood yielding plants like Sal, Sagoon etc., and the colonization of the tribals in this forest belt for working in such plantation project. The idea thus formed from the study about the natural habitat of the region and the economic background of the tribals offer significant scope to deal with the material culture of the people in analysing their technology of production, structural pattern, manipulation technique, utilitarian value and many other cultural aspects.

A prescribed schedule is used for the collection of field data on individual specimen. This schedule is administered at the time of collection of the specimen in the field either from its owner or manufacturer.

It is done so that all the relevant information concerning the specimen may be collected from the competent person at the right place offering no scope of missing anything worth-mentioning. The structure of the schedule used for this purpose is as follows:

The schedule on the basis of the nature of information contained therein is divided into two parts: (i) Museological information and (ii) Anthropological information. The museological information is specifically meant for maintaining the record of the specimen concerned in the museum particularly for its documentation. Anthropological information which are field data are concerned with the study of the specimen from the anthropological point of view.

In collecting the anthropological information of a specimen, special emphasis has been given on two aspects. They are technological aspect and utilitarian aspect. Structural features, manufacturing process, manipulation technique, material used in prepation are very carefully considered to ascertain as to how the people of simple technology with their traditional skill and simple cutting tools prepare their material goods with locally available raw materials for the exploitation of nature to their advantage. From these information attempt may be made to bring out the correlation that exists among ecology, economy and production technology when the artefacts related to subsistence activities are studied from anthropological stand point. Apart from the technological aspect there are questions in the schedule to bring out economic, sociological, religious and aesthetic importance of the artefact.

Museum is the repository of cultural artefacts—the concrete evidence of material culture. Hence a museum anthropologist gives primary importance to the study of material aspect of an ethnographical object.

Other aspects receive secondary importance. In studying the material aspect of an artefact from the museum standpoint technology is very much counted. Much importance has, therefore, been given to the technological aspect in collecting information of a specimen from field.

The information collected through administering schedules are theoretical in nature. These theoretical information together with brief descriptive account of a specimen are maintained in the accession register. These information in codified form are accommodated in the index card together with a photograph of the specimen concerned. Research reference card contains information in greater detail together with some part of the anthropological information. The anthropological information collected through administering schedule are used as field data for writing articles on the specimens collected from field. These articles are published in the bulletin of the Indian Museum and the anthropological journals published from outside. The schedules are maintained in separate files to use them as data bank for research purposes.

The field data collected through schedules has been authenticated by pictorial documentation. Still photography has been widely used for the purpose. Coloured and black and white photographs have been snapped. Transparency of selected photographs has also been prepared to use the same for illustrated lecture and similar other educational activities. A seasoned photographer of the museum with field experience in ethnographical photography was a member of the field party for covering the work of photographic documentation.

It is with the help of the still photographs an ethnographic album has been prepared. This album is maintained in the photo-library of the Indian Museum. Both the staff members of the museum and the interested outsiders may consult it to serve their purposes. Instead of confining only to the still photographs the Indian Museum is contemplating to introduce video filming for the field documentation of cultural activities. Script for preparation of an ethnographic film on Rabha emphasising on their material culture is under preparation. A film will be taken on the subject in the near future. The ethnographic album contains photographs each measuring 8"×6". A comparatively big size still photograph capturing detailed picture serves not only as valuable authentic record but also affords appreciable study facilities. The still photographs depicting the structural features of a specimen, its artistic quality, constituent materials, manufacturing and manipulation techniques, utilitarian role etc., serve not only as authentic documentation of cultural life, but also furnish valuable field data for research.

Conclusion:

As discussed earlier the study of material culture in the Indian Museum has been channalised in the direction of making correlated study among ecology, economy and technology. The related field data on the tribe Rabha and their physical environment were collected keeping this view in mind. Published data on physical environment and cultural life of the tribe are maintained in the section as well. Representative examples of traditional cultural artefacts readily at hand together with adequate field data and documentation photographs of the field situation along with published literature on the tribe available in the library, a scholar is in a position to carry out the study of the material culture of the Rabhas conveniently. Thus by adopting systematic collection policy and implementing the same in proper way, the anthropological collection of the Indian Museum is now being piled up in such a way that the scholars may conveniently utilise the same for study and research.

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OUR CONTRIBUTORS

Baidyanath Saraswati	*Prof. of Anthropology, North-East Hills University, Shillong, Meghalaya*
S. B. Chakraborty	*Superintending Anthropologist, An. S. India, North-East Regional Centre, Upper Lachumiere, Shillong*
A. K. Danda	*Prof. of Anthropology, North Bengal University, Siliguri, Darjeeling*
N. K. Behura	*Prof. and Head of the Deptt. of Anthropology, Utkal University, Bhubaneswar*
B. K. Behura	*Curator, Anthropology Museum, Deptt. of Anth., Utkal University*
P. K. Bhowmick	*Prof., Deptt. of Anthropology, University of Calcutta*
Uma Charan Mahanty	*Retd. Prof. of Anthropology, University of Madras*
N. C. Chowdhuri	*Prof., Deptt. of Sociology and Social Anthropology, North Bengal University, Siliguri*
Sachchidananda	*Emeritus Professor, A. N. S. Institute of Social Studies, Patna*
R. K. Kar	*Reader, Deptt. of Anthropology, Dibrugarh University, Dibrugarh*
D. N. Majumder	*Fellow, Anthropological Survey of India, Shillong*
Sachin Roy	*Ex-Director, Indian Museum, Calcutta*
K. N. Sahay	*Prof. of Anthropology*
L. K. Mahapatra	*Emeritus Fellow (U.G.C.), Utkal University*
B. K. Roy Burman	*Fellow, Centre for the Study of Developing Societies, New Delhi*
A. K. Chatterjee	*Keeper, Anthropology, Indian Museum, Calcutta*
Sabita Ranjan Sarkar	*Ex-Keeper, Anthropology, Indian Museum, Calcutta*

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